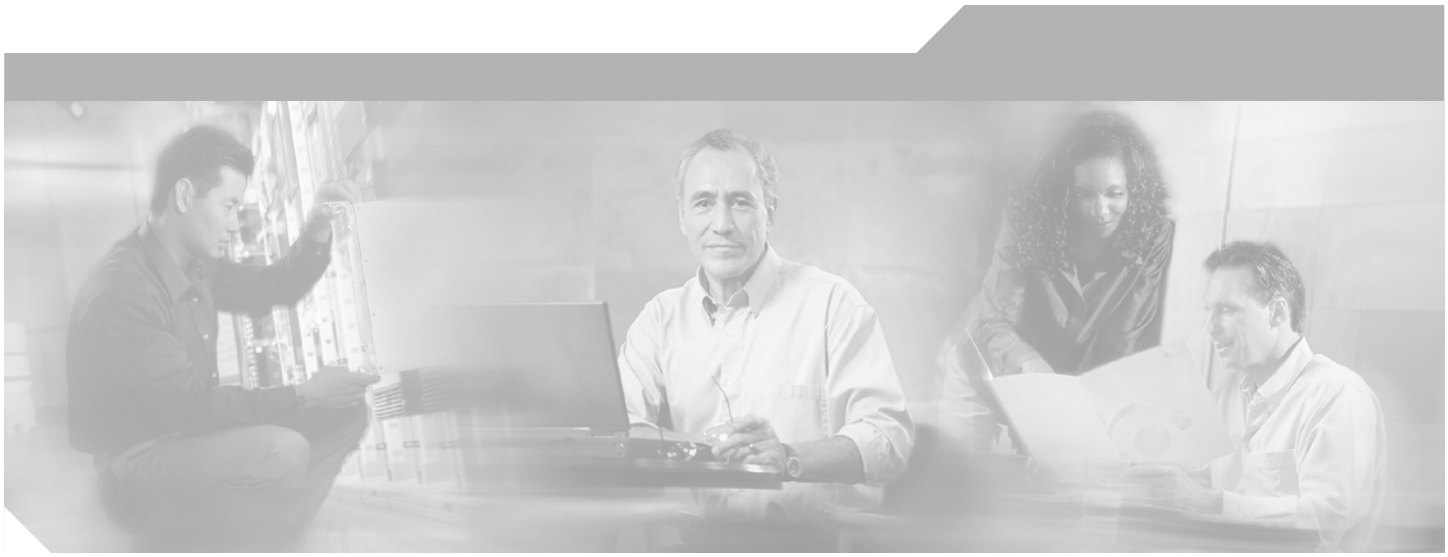

Cisco MGX 8800/8900 Series Hardware Installation Guide

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About This Guide

This section desribes the audience, purpose, and organization of the *Cisco MGX 8800/8900 Series Hardware Installation Guide*. It also explains the conventions used to present information in this guide.

Audience

This guide is intended for use by installers, operators, network designers, and managers responsible for installing, configuring, or maintaining Cisco MGX switches or media gateways. These users should be familiar with telecommunications products and networking systems.

Purpose

This hardware installation guide describes how to set up and install the Cisco MGX 8850, Cisco MGX 8850/B, Cisco MGX 8950, Cisco MGX 8830 and Cisco MGX 8830/B switches. It also describes how to setup and install the MGX 8880 Media Gateway.

After completing the installation procedures covered in this guide, refer to the appropriate related documents to configure the switch or gateway. Refer to "Documentation" later in this preface for guidance on which documents to use.

Organization

This guide is organized as follows:

- Chapter 1, "Product Overviews," provides an overview of the MGX switches, MGX media gateway, and their related components.
- Chapter 2, "Illustrated Card List for MGX Switches and the MGX 8880 Media Gateway," provides an overview of all cards used in Cisco MGX switches and the MGX 8880 Media Gateway from MGX software Releases 2 through 5.1.
- Chapter 3, "Preparing for Installation," lists site specifications and tools required for installing each switch or gateway and its related components.
- Chapter 4, "Planning for Card Redundancy, Line Redundancy, and Bulk Distribution," describes how to plan for card redundancy, line redundancy, and bulk distribution.
- Chapter 5, "Installing the Cisco MGX Switch or Gateway," contains procedures for installing each Cisco MGX chassis, whether in a rack or in a Cisco-supplied cabinet.

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- Chapter 6, "Maintaining the Cisco MGX Switch or Gateway," provides maintenance procedures for each switch or gateway.
- Appendix A, "Front Card Specifications," provides technical specifications for cards and modules.
- Appendix B, "Cable Specifications," provides cabling and pinout information for cables used with each chassis and its cards.
- Appendix C, "Earthing and Bonding Recommendations," discusses the techniques and policies that Cisco practices with regard to DC power, earthing, and bonding of Cisco equipment. It also explains why these techniques are the best practice.
- Appendix D, "Guide to Transceivers (SFPs) Used with MGX Back Cards,"summarizes the small form-factor pluggable (SFP) transceivers used with MGX back cards.
- The glossary defines all acronyms used throughout this guide.

Conventions

This guide uses the conventions listed in this section and in Table 1. *MGX switches* collectively refers to all the multiservice switches and gateways documented in this guide.

Table 1 Conventions Used in this Guide

Convention	Definition	Sample
boldface font	Commands and keywords are in **boldface**. Also used for names of some elements in a graphical user interface (GUI).	This is similar to the UNIX **route** command.
italic font	Arguments for which you supply values are in *italics*. Also used for publication names and for emphasis.	See the *Regulatory Compliance and Safety Information for Cisco Multiservice Switch Products (MGX, BPX, and SES)* for further details.
`screen` font	Terminal sessions and information the system displays are in `screen` font.	`Are you ready to continue? [Y]`
`boldface screen` font	Information you must enter is in **`boldface screen`** font.	Login: **`root`** Password: **`<password>`**
^	The symbol ^ represents the Control key labeled *Ctrl*.	^D This key combination in a screen display means hold down the Control key while you press the D key.
[ ]	Elements in square brackets are optional. Also used for default responses to system prompts.	[**no**] **offset-list** {**in** | **out**} *offset*
{x | y | z}	Alternative keywords are grouped in braces and separated by vertical bars.	**offset-list** {**in** | **out**} *offset*
< >	Nonprinting characters such as passwords are in angle brackets.	`Password: <cisco123>`

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Table 1 Conventions Used in this Guide (continued)

Convention	Definition	Sample
{ }	Braces indicate a required choice.	**offset-list** {**in** | **out**} *offset*
[{ }]	Braces within a bracket indicate a required choice within an optional element.	[{*letter*|*number*}**Enter**]

Notes, Warnings, and Cautions

This section explains the conventions used for notes, warnings, and cautions.

Note A Note highlights helpful information, such as suggestions or references to material not covered in the guide.

Tip A Tip contains information that might help you solve a problem or save time.

Caution A Caution emphasizes a situation in which equipment can be damaged or data can be corrupted or lost.

Warning **A Warning emphasizes a safety concern, where a very serious and hazardous situation could result if instructions are not carefully adhered to.**

Notes about Warnings

Warnings used in this document are translated into many languages in the *Regulatory Compliance and Safety Information for Cisco Multiservice Switch Products (MGX, BPX, and SES).*

There are 3 types of Warnings in hardware guides:

- EMC (electromagnetic compatibility)
- Safety
- Telecom

Warning statements are numbered. The numbering makes it clearer which Warning translation goes with which source Warning.

Scope of this Guide

This guide consolidates the following guides into one document and adds information about MGX Release 5 (and greater) hardware features. Thus, this guide covers all MGX switches supported by software Release 2.0 through 5.1, and makes the following guides obsolete:

- *Cisco MGX 8850 Hardware Installation Guide, Release 2*
- *Cisco MGX 8850 Hardware Installation Guide, Release 2.1*

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- *Cisco MGX 8950 Hardware Installation Guide, Release 2.1*
- *Cisco MGX 8850 (PXM45 and PXM1E) Hardware Installation Guide, Release 3*
- *Cisco MGX 8950 Hardware Installation Guide, Release 3*
- *Cisco MGX 8830 Hardware Installation Guide, Release 3*
- *Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8950, and Cisco MGX 8830 Hardware Installation Guide, Releases 2 Through 4*

New Hardware Introduced in Releases 4.0.10 through 5.3

This guide was updated to describe the modules and hardware introduced in MGX Releases 4.0.10 through 5.1 (see Table 2).

Table 2 Hardware Introduced in Releases 4.0.10 or 5.3, by Chassis

Hardware Introduced in MGX Release 4.0.10 through 5.1	MGX 8850 (PXM1E)	MGX 8850 (PXM45)	MGX 8850/B	MGX 8830	MGX 8830/B	MGX 8950	MGX 8880
MGX 8880 Media Gateway	—	—	—	—	—	—	x
MGX 8850/B	—	—	—	—	x	—	—
MGX 8830/B	—	—	x	—	—	—	—
AXSM-16-155-XG 16-port OC3 Module with VSVD	—	x	x	—	—	x	—
MGX8950-EXTDR-CON connector card	—	—	—	—	—	x	—
RCON-IT05-8850 connector card[1]	—	—	—	—	—	—	x
RCON-IT03-8850 connector card[1]	—	—	x	—	—	—	—
RCON-IT03-8830 connector card[1]	—	—	—	—	x	—	—
MGX-VXSM-4-155 Voice Switch Service Module (VXSM), 4 OC3/STM-1	—	x	x	—	—	—	x
MGX-VXSM-48T1E1 Voice Switch Service Module (VXSM)	—	x	x	—	—	—	x
MPSM-8-T1E1Multiprotocol Service Module	x	x	x	x	x	—	—
MPSM-T3E3-155 Multiprotocol Service Module	x	x	x	x	x	—	—
MPSM-16-T1E1 Multiprotocol Service Module	x	x	x	x	x	—	—
SRME/B Enhanced Service Resource Module	x	x	x	x	x	—	x
MGX-VXSM-T3	—	x	x	—	—	—	x

1. Pre-installed in chassis.

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New Back Cards Introduced in Releases 4.0.10 through 5.3

The following back cards were introduced in MGX Releases 4.0.10 through 5.1:

- BNC-3-T3E3 3-port T3E3
- MCC-16-E1-1N
- MGX-2GE
- MGX-2OC12POS
- MGX-BNC-3T3-M
- MGX-STM1-EL-1
- RBBN-16-T1E1-1N
- RED-16-T1E1
- SFP-2-155
- SMB-2-155-EL
- VXSM-BC-3T3
- MGX-RJ45-5-ETH

Documentation

A *Finding Cisco User Documentation Online* document ships with your product. That guide contains general information about how to locate Cisco MGX, BPX, SES, and CWM documentation online.

Documentation Notes for these Product Releases

This release includes new hardware or features for the following releases:

- Cisco MGX Release 5.2 introduces the Cisco MGX 8850/B multiservice switch
- Cisco MGX Release 5.2, for these multiservice switches:
  - Cisco MGX 8850 (PXM1E)
  - Cisco MGX 8850 (PXM45)
  - Cisco MGX 8950
  - Cisco MGX 8830
- Cisco MGX Release 1.3, for these multiservice switches:
  - Cisco MGX 8850 (PXM1)
  - Cisco MGX 8230
  - Cisco MGX 8250
- Cisco MGX Release 5.2, for the Route Processor Modules (RPM-XF and RPM-PR)
- Cisco WAN Manager Release 15.1. CWM Release 15 introduced a helpful new documentation feature: web-based *online help*. To invoke online help, press **F1** on a PC, press the **Help** key on a UNIX workstation, or select **Help** from the main or popup menu. Cisco WAN Manager online help has been updated for Release 15.1.

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Other components of multiservice WAN products, such as the Service Expansion Shelf (SES) and WAN switching software have no new features for this release.

Related Documentation

This section describes the user guides and release notes that support this release of Cisco Multiservice Switch products.

User Guide—Order of Use

Use the guides listed here in the following order:

Step 1 Refer to the documents that ship with your product. Observe all safety precautions.

- *Regulatory Compliance and Safety Information for Cisco Multiservice Switch Products (MGX, BPX, and SES)*—This document familiarizes you with safety precautions for your product.
- *Finding Cisco User Documentation Online*—This document explains how to find documentation for MGX, BPX, and SES multiservice switches and media gateways as well as CWM network management software. These documents are available only online.
- *Installation Warning Card*—This document provides precautions about installing your cards. It explains such subjects as removing the shipping tab and inserting cards properly into the correct slots.

Step 2 Refer to the release notes for your product.

Step 3 If your network uses the CWM network management system, upgrade CWM. (If you are going to install CWM for the first time, do so *after* Step 4.) Upgrade instructions are included in the following documents:

- *Cisco WAN Manager Installation Guide, Release 15.3.00*
- *Cisco WAN Manager User's Guide, Release 15.3.00*

Step 4 If your network contains MGX and SES products, refer to this guide for planning information:

- *Cisco PNNI Network Planning Guide for MGX and SES Products*

Step 5 Refer to these guides for information about installing cards and cables in the MGX chassis:

- *Cisco MGX 8800/8900 Hardware Installation Guide, Releases 2 - 5.3* for installing cards and cables in these chassis.
- *Cisco MGX 8xxx Edge Concentrator Installation and Configuration Guide* for installing cards and cables in the Cisco MGX 8230, Cisco MGX 8250, or Cisco MGX 8850 (PXM1) chassis.

Step 6 Refer to the guides that help you configure your MGX switch and processor cards:

- *Cisco MGX 8800/8900 Series Configuration Guide, Release 5.2* for these chassis.
- *Cisco MGX 8xxx Edge Concentrator Installation and Configuration Guide* for the Cisco MGX 8230, Cisco MGX 8250, or Cisco MGX 8850 (PXM1) chassis.

Step 7 Refer to the guide that supports the additional cards you intend to install in your switch. For example:

- Services guides can help you establish ATM, Frame Relay, or circuit emulation services on your switch.
- VISM guides can help you set up your switch as a voice gateway, and an RPM guide can help you implement IP on the switch.

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Step 8 Additional guides, such as command reference guides and error message documentation, can help with the daily operation and maintenance of your switch.

Note User guide titles may be different for earlier software releases. The titles shown in Table 3 are for the September 2005 release.

User Guide Titles and Descriptions

Table 3 lists the technical guides and release notes that support the September 2005 multiservice switch product releases. User documentation and release notes in Table 3 are listed in order of use and include information about which multiservice switch or media gateway the document supports.

The Cisco MGX 8230, Cisco MGX 8250, and Cisco MGX 8850 (PXM1) switch documentation was not updated for the September 2005 release. Therefore, some information about configuring and using the new MPSM-8-T1E1 card in these switches is included in the following guides:

- *Cisco ATM Services (AUSM/MPSM-8-T1E1) Configuration Guide and Command Reference for MGX Switches, Release 5.2*
- *Cisco Frame Relay Services (FRSM/MPSM-8-T1E1) Configuration Guide and Command Reference for MGX Switches, Release 5.2*
- *Cisco Circuit Emulation Services (CESM/MPSM-8-T1E1) Configuration Guide and Command Reference for MGX Switches, Release 5.2*

Information about how to install or upgrade to the MPSM-8-T1E1 card in Cisco MGX 8230, Cisco MGX 8250, and Cisco MGX 8850 (PXM1) switches is in the *Release Notes for Cisco MGX 8230, Cisco MGX 8250, and Cisco MGX 8850 (PXM1) Switches, Release 1.3.14*.

Note Refer to each product's release notes for the latest information on features, bug fixes, and more.

Terms

Two main types of ATM cards are used in MGX switches: AXSM and AUSM. *AXSM* stands for ATM Switching Service Module. *AUSM* stands for ATM UNI (User Network Interface) Service Module.

CWM stands for Cisco WAN Manager, our multiservice switch network management system.

Legacy service module refers to a previously introduced card. For this release, the term is used specifically for the CESM-8-T1E1, FRSM-8-T1E1, and AUSM-8-T1E1 cards, which can now be replaced by the new MPSM-8-T1E1 card.

MPSM stands for Multiprotocol Service Module.

RPM stands for Route Processor Module.

SES stands for Service Expansion Shelf.

VISM stands for Voice Interworking Service Module.

VXSM stands for Voice Switch Service Module.

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Table 3 User Guides and Release Notes for Cisco MGX and BPX Switches and Media Gateways

Document Title and Part Number	BPX with SES Rel. 4	MGX 8230 Rel. 1.3	MGX 8250 Rel. 1.3	MGX 8850 (PXM1) Rel. 1.3	MGX 8830 Rel. 5.3	MGX 8850 (PXM1E) Rel. 5.3	MGX 8850 (PXM45) Rel. 5.3	MGX 8950 Rel. 5.3	MGX 8880 Rel. 5.3.
Overview and Safety Documents									
Finding Cisco User Documentation Online DOC-7814807=	x	x	x	x	x	x	x	x	x
Installation Warning Card DOC-7812348=	x	x	x	x	x	x	x	x	x
Regulatory Compliance and Safety Information for Cisco Multiservice Switch Products (MGX, BPX, and SES) DOC-7814790=	x	x	x	x	x	x	x	x	x
Release Notes for the Cisco MGX 8880 Media Gateway, Release 5.3.00 OL-8892-01	—	—	—	—	—	—	—	—	x
Release Notes for Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8950, and Cisco MGX 8830 Switches, Release 5.3.00 OL-8891-01	—	—	—	—	x	x	x	x	
Release Notes for Cisco MGX 8230, Cisco MGX 8250, and Cisco MGX 8850 (PXM1) Switches, Release 1.3.14 OL-8973-01	—	x	x	x	—	—	—	—	—
Release Notes for the Cisco Voice Switch Service Module (VXSM), Release 5.3.00 OL-10285-01	—	—	—	—	—	—	x	—	x
Release Notes for Cisco WAN Manager, Release 15.3.00 OL-10216-01	x	x	x	x	x	x	x	x	x
Release Notes for the Cisco Voice Interworking Service Module (VISM), Release 3.3.25 OL-8428-01	—	x	x	x	x	x	x	—	x

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Table 3 User Guides and Release Notes for Cisco MGX and BPX Switches and Media Gateways (continued)

Document Title and Part Number	BPX with SES Rel. 4	MGX 8230 Rel. 1.3	MGX 8250 Rel. 1.3	MGX 8850 (PXM1) Rel. 1.3	MGX 8830 Rel. 5.3	MGX 8850 (PXM1E) Rel. 5.3	MGX 8850 (PXM45) Rel. 5.3	MGX 8950 Rel. 5.3	MGX 8880 Rel. 5.3.
Release Notes for Cisco MGX Route Processor Module (RPM-XF) IOS Release 12.4(6)T1 for PXM45-based Switches, Release 5.3.00 OL-8893-01	—	—	—	—	x	—	x	x	x
Release Notes for Cisco MGX Route Processor Module (RPM-PR) IOS Release 12.4(6)T1 for MGX Releases 1.3.14 and 5.3.00 OL-8894-01	—	x	x	x	x	x	x	x	x
Cisco MGX 8230 Edge Concentrator Overview, Release 1.1.3[1] DOC-7812899=	—	x	—	—	—	—	—	—	—
Cisco MGX 8250 Edge Concentrator Overview, Release 1.1.3[1] DOC-7811576=	—	—	x	—	—	—	—	—	—
Cisco MGX 8850 Multiservice Switch Overview, Release 1.1.3[1] OL-1154-01	—	—	—	x	—	—	—	—	—
Hardware Installation Guides									
Cisco MGX 8800/8900 Hardware Installation Guide, Releases 2 - 5.3 OL-4545-01	—	—	—	—	x	x	x	x	x
Cisco Service Expansion Shelf Hardware Installation Guide, Release 1[1] DOC-786122=	x	—	—	—	—	—	—	—	—
Planning and Configuration Guides									
Cisco PNNI Network Planning Guide for MGX and SES Products OL-3847-01	x	—	—	—	x	x	x	x	x
Cisco MGX 8800/8900 Series Configuration Guide, Release 5.2 OL-6482-01	—	—	—	—	x	x	x	x	x

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Table 3 User Guides and Release Notes for Cisco MGX and BPX Switches and Media Gateways (continued)

Document Title and Part Number	BPX with SES Rel. 4	MGX 8230 Rel. 1.3	MGX 8250 Rel. 1.3	MGX 8850 (PXM1) Rel. 1.3	MGX 8830 Rel. 5.3	MGX 8850 (PXM1E) Rel. 5.3	MGX 8850 (PXM45) Rel. 5.3	MGX 8950 Rel. 5.3	MGX 8880 Rel. 5.3.
Cisco WAN Manager Installation Guide, Release 15.3.00 OL-10358-01	x	x	x	x	x	x	x	x	x
Cisco WAN Manager User's Guide, Release 15.3.00 OL-10427-01	x	x	x	x	x	x	x	x	x
Cisco MGX 8850 Edge Concentrator Installation and Configuration, Release 1.1.3[1] DOC-7811223=	—	—	—	x	—	—	—	—	—
Cisco SES PNNI Controller Software Configuration Guide, Release 3[1] DOC-7814258=	x	—	—	—	—	—	—	—	—
Cisco MGX 8230 Edge Concentrator Installation and Configuration, Release 1.1.3[1] DOC-7811215=	—	x	—	—	—	—	—	—	—
Cisco MGX 8250 Edge Concentrator Installation and Configuration, Release 1.1.3[1] DOC-7811217=	—	—	x	—	—	—	—	—	—
Service Module Configuration and Reference Guides									
Cisco MGX Route Processor Module (RPM-PR) Installation and Configuration Guide, Release 5.2[1] OL-7349-01	—	x	x	x	—	—	—	—	—
Frame Relay Software Configuration Guide and Command Reference for the Cisco MGX 8850 FRSM12 Card, Release 3[1] DOC-7810327=	—	—	—	—	—	—	x	—	—
Cisco ATM Services (AUSM/MPSM-8-T1E1) Configuration Guide and Command Reference for MGX Switches, Release 5.2[2] OL-6479-01	—	[2]	[2]	[2]	x	x	x	—	—

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Table 3 User Guides and Release Notes for Cisco MGX and BPX Switches and Media Gateways (continued)

Document Title and Part Number	BPX with SES Rel. 4	MGX 8230 Rel. 1.3	MGX 8250 Rel. 1.3	MGX 8850 (PXM1) Rel. 1.3	MGX 8830 Rel. 5.3	MGX 8850 (PXM1E) Rel. 5.3	MGX 8850 (PXM45) Rel. 5.3	MGX 8950 Rel. 5.3	MGX 8880 Rel. 5.3.
Cisco Frame Relay Services (FRSM/MPSM-8-T1E1) Configuration Guide and Command Reference for MGX Switches, Release 5.2[2] OL-6480-01	—	[2]	[2]	[2]	x	x	x	—	—
Cisco Circuit Emulation Services (CESM/MPSM-8-T1E1) Configuration Guide and Command Reference for MGX Switches, Release 5.2[2] OL-6481-01	—	[2]	[2]	[2]	x	x	x	—	—
Cisco MGX Route Processor Module (RPM-XF) Installation and Configuration Guide, Release 5.2[1] OL-6594-01	—	—	—	—	—	—	x	x	x
Cisco ATM Services (AXSM) Configuration Guide and Command Reference for MGX Switches, Release 5.2 OL-6484-01	—	—	—	—	—	—	x	x	x
Cisco ATM and Frame Relay Services (MPSM-T3E3-155 and MPSM-16-T1E1) Configuration Guide and Command Reference for MGX Switches, Release 5.2 OL-6487-01	—	—	—	—	x	—	x	—	—
Cisco Voice Switch Services Configuration Guide for MGX Switches and Media Gateways, Release 5.3 OL-10284-01	—	—	—	—	—	—	x	—	x
Cisco Voice Interworking Services (VISM) Configuration Guide and Command Reference, Release 3.3 OL-5358-01	—	x	x	x	x	x	x	—	x
Reference Guides									
Cisco MGX 8230 Multiservice Gateway Error Messages, Release 1.1.3[1] DOC-78112113=	—	x	—	—	—	—	—	—	—

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Table 3 User Guides and Release Notes for Cisco MGX and BPX Switches and Media Gateways (continued)

Document Title and Part Number	BPX with SES Rel. 4	MGX 8230 Rel. 1.3	MGX 8250 Rel. 1.3	MGX 8850 (PXM1) Rel. 1.3	MGX 8830 Rel. 5.3	MGX 8850 (PXM1E) Rel. 5.3	MGX 8850 (PXM45) Rel. 5.3	MGX 8950 Rel. 5.3	MGX 8880 Rel. 5.3.
Cisco MGX 8230 Multiservice Gateway Command Reference, Release 1.1.3[1] DOC-7811211=	—	x	—	—	—	—	—	—	—
Cisco MGX 8250 Multiservice Gateway Command Reference, Release 1.1.3[1] DOC-7811212=	—	—	x	—	—	—	—	—	—
Cisco MGX 8250 Multiservice Gateway Error Messages, Release 1.1.3[1] DOC-7811216=	—	—	x	—	—	—	—	—	—
Cisco MGX 8800 Series Switch Command Reference, Release 1.1.3[1] DOC-7811210=	—	x	x	x	—	—	—	—	—
Cisco MGX 8800 Series Switch System Error Messages, Release 1.1.3[1] DOC-7811240=	—	x	x	x	—	—	—	—	—
Cisco SES PNNI Controller Command Reference, Release 3[1] DOC-7814260=	x	—	—	—	—	—	—	—	—
Cisco MGX 8800/8900 Series Command Reference, Release 5.2 OL-6483-01	—	—	—	—	x	x	x	x	x
Cisco Voice Switch Services Command Reference for MGX Switches and Media Gateways, Release 5.3 OL-10283-01	—	—	—	—	—	—	x	—	x
Cisco WAN Manager SNMP Service Agent, Release 15.3.00 OL-10190-01	x	x	x	x	x	x	x	x	x
Cisco WAN Manager Database Interface Guide, Release 15.3.00 OL-10140-01	x	x	x	x	x	x	x	x	x

1. This document was not updated for the September 2005 release.

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2. Some configuration and command information is included in this guide for using the multiprotocol service module (MPSM-8-T1E1/MPSM-16-T1E1) in a Cisco MGX 8230, MGX 8250, or MGX 8850 (PXM1) switch.

Note For the September 2005 product release, there are no new features for the Service Expansion Shelf (SES) of the BPX switch and BPX WAN switching software. Therefore, documentation for these items was not updated. Table 3 lists the most recent user guides and release notes for these products.

Table 3 also lists the latest documentation available for the Cisco MGX 8230, Cisco MGX 8250, and Cisco MGX 8850 (PXM1) switches. These switches use the PXM1 processor card. Although there are new features in MGX Release 1.3 for these switches, only the release notes were updated. And the following guides contain some information about configuring the MPSM-8-T1E1 and MPSM-16-T1E1 cards for use in these switches:

- *Cisco Circuit Emulation Services (CESM/MPSM-8-T1E1) Configuration Guide and Command Reference for MGX Switches, Release 5.2*
- *Cisco Frame Relay Services (FRSM/MPSM-8-T1E1) Configuration Guide and Command Reference for MGX Switches, Release 5.2*
- *Cisco ATM Services (AUSM/MPSM-8-T1E1) Configuration Guide and Command Reference for MGX Switches, Release 5.2*

Table 4 lists the documents that ship with product.

Table 5 contains alphabetized titles and descriptions of all the guides and release notes listed in Table 3.

Table 4 Documents that Ship with Multiservice Switch Products

Document Title	Description
Finding Cisco User Documentation Online DOC-7817081=	Describes how to find the guides and release notes that support multiservice switches and network management products. These documents are available only online. **This guide ships with product.**
Installation Warning Card DOC-7812348=	**Contains precautions that you should take before you insert a card into a slot. This Warning Card ships with product.**
Regulatory Compliance and Safety Information for Cisco Multiservice Switch Products (MGX, BPX, and SES) DOC-7814790=	Provides regulatory compliance information, product warnings, and safety recommendations for all the Cisco MGX multiservice switches: MGX 8230, MGX 8250, MGX 8850 (PXM1), MGX 8850 (PXM45), MGX 8850 (PXM1E), MGX 8830 and MGX 8950. Also provides such information for the MGX 8880 Media Gateway. **This guide ships with product.**

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Table 5 User Guides and Release Notes for Cisco Multiservice Switch Products

Document Title	Description
Cisco ATM and Frame Relay Services (MPSM-T3E3-155 and MPSM-16-T1E1) Configuration Guide and Command Reference for MGX Switches, Release 5.2 OL-6487-01	Provides software configuration procedures for provisioning ATM and Frame Relay connections on the new MPSM-T3E3-155 multiprotocol service module. Also describes all MPSM-T3E3-155 commands.
Cisco ATM Services (AUSM/MPSM-8-T1E1) Configuration Guide and Command Reference for MGX Switches, Release 5.2 OL-6479-01	Provides software configuration procedures for provisioning connections and managing the AUSM cards supported in this release. Also describes all AUSM commands. Includes software configuration procedures for provisioning connections and managing the MPSM-8-T1E1 card as an AUSM card replacement.
Cisco ATM Services (AXSM) Configuration Guide and Command Reference for MGX Switches, Release 5.2 OL-4548-01	Explains how to configure the AXSM cards and provides a command reference that describes the AXSM commands in detail. The AXSM cards covered in this guide are the AXSM-XG, AXSM/A, AXSM/B, AXSM-E, and AXSM-32-T1E1-E.
Cisco Circuit Emulation Services (CESM/MPSM-8-T1E1) Configuration Guide and Command Reference for MGX Switches, Release 5.2 OL-6481-01	Provides software configuration procedures for provisioning connections and managing the Circuit Emulation Service Module (CESM) cards supported in this release. Also describes all CESM commands. Includes software configuration procedures for provisioning connections and managing the MPSM-8-T1E1 card as a CESM card replacement.
Cisco Frame Relay Services (FRSM/MPSM-8-T1E1) Configuration Guide and Command Reference for MGX Switches, Release 5.2 OL-6480-01	Provides software configuration procedures for provisioning connections and managing the Frame Relay Service Module (FRSM) cards supported in this release. Also describes all FRSM commands. Includes software configuration procedures for provisioning connections and managing the MPSM-8-T1E1 card as an FRSM card replacement.
Cisco MGX 8230 Edge Concentrator Installation and Configuration, Release 1.1.3 DOC-7811215=	Provides installation instructions for the Cisco MGX 8230 edge concentrator.
Cisco MGX 8230 Edge Concentrator Overview, Release 1.1.3 DOC-7812899=	Describes the system components and function of the Cisco MGX 8250 edge concentrator.
Cisco MGX 8230 Multiservice Gateway Command Reference, Release 1.1.3 DOC-7811211=	Provides detailed information on the general command line interface commands.
Cisco MGX 8230 Multiservice Gateway Error Messages, Release 1.1.3 DOC-78112113=	Provides error message descriptions and recovery procedures.
Cisco MGX 8250 Edge Concentrator Installation and Configuration, Release 1.1.3 DOC-7811217=	Provides installation instructions for the Cisco MGX 8250 edge concentrator.

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Table 5 User Guides and Release Notes for Cisco Multiservice Switch Products (continued)

Document Title	Description
Cisco MGX 8250 Edge Concentrator Overview, Release 1.1.3 DOC-7811576=	Describes the system components and function of the Cisco MGX 8250 edge concentrator.
Cisco MGX 8250 Multiservice Gateway Command Reference, Release 1.1.3 DOC-7811212=	Provides detailed information on the general command line interface commands.
Cisco MGX 8250 Multiservice Gateway Error Messages, Release 1.1.3 DOC-7811216=	Provides error message descriptions and recovery procedures.
Cisco MGX 8800 Series Switch Command Reference, Release 1.1.3 DOC-7811210=	Provides detailed information on the general command line for the Cisco MGX 8850 (PXM1), Cisco MGX 8250, and Cisco MGX 8230 edge concentrators.
Cisco MGX 8800 Series Switch System Error Messages, Release 1.1.3 DOC-7811240=	Provides error message descriptions and recovery procedures for Cisco MGX 8850 (PXM1), Cisco MGX 8250, and Cisco MGX 8230 edge concentrators.
Cisco MGX 8800/8900 Hardware Installation Guide, Releases 2 - 5.3 OL-4545-01	Describes how to install the Cisco MGX 8950, the Cisco MGX 8850 (PXM1E/PXM45), the Cisco MGX 8850/B (PXM1E/PXM45), and the Cisco MGX 8830 switches. Also describes how to install the MGX 8880 Media Gateway. This document explains what each switch does and covers site preparation, grounding, safety, card installation, and cabling. The Cisco MGX 8850 switch uses either a PXM45 or a PXM1E controller card and provides support for both serial bus-based and cell bus-based service modules. The Cisco MGX 8830 switch uses a PXM1E controller card and supports cell bus-based service modules. The Cisco MGX 8950 supports only serial bus-based service modules. The Cisco MGX 8880 uses a PXM45/C controller card, and supports only serial bus-based service modules. *This hardware installation guide replaces all previous hardware guides for these switches.*
Cisco MGX 8800/8900 Series Configuration Guide, Release 5.2 OL-6482-01	Describes how to configure the Cisco MGX 8880 Media Gateway. Also describes how to configure Cisco MGX 8850 (PXM1E), Cisco MGX 8850 (PXM45), the Cisco MGX 8850/B (PXM1E/PXM45), and Cisco MGX 8830 switches to operate as ATM edge switches and the Cisco MGX 8950 switch to operate as a core switch. This guide also provides some operation and maintenance procedures.
Cisco MGX 8800/8900 Series Command Reference, Release 5.2 OL-6483-01	Describes the PXM commands that are available in the CLI of the Cisco MGX 8850 (PXM45), Cisco MGX 8850 (PXM1E), Cisco MGX 8950, and Cisco MGX 8830 switches. Also describes the PXM commands that are available in the CLI of the Cisco MGX 8880 Media Gateway.

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Table 5 User Guides and Release Notes for Cisco Multiservice Switch Products (continued)

Document Title	Description
Cisco MGX 8850 Edge Concentrator Installation and Configuration, Release 1.1.3 DOC-7811223=	Provides installation instructions for the Cisco MGX 8850 (PXM1) edge concentrator.
Cisco MGX 8850 Multiservice Switch Overview, Release 1.1.3 OL-1154-01	Describes the system components and function of the Cisco MGX 8850 (PXM1) edge concentrator.
Cisco MGX and Service Expansion Shelf Error Messages, Release 5.0 OL-6485-01	Provides error message descriptions and recovery procedures.
Cisco MGX Route Processor Module (RPM-XF) Installation and Configuration Guide, Release 5.2 OL-6954-01	Describes how to install and configure the Cisco MGX Route Processor Module (RPM-XF) in the Cisco MGX 8850 (PXM45), Cisco MGX 8880 (PXM45), and Cisco MGX 8950 switch. Also provides site preparation procedures, troubleshooting procedures, maintenance procedures, cable and connector specifications, and basic Cisco IOS configuration information.
Cisco MGX Route Processor Module (RPM-PR) Installation and Configuration Guide, Release 5.2 OL-7349-01	Describes how to install and configure the Cisco MGX Route Processor Module (RPM/B or RPM-PR) in the Cisco MGX 8850 (PXM1), the Cisco MGX 8250, and the Cisco MGX 8230 edge concentrators. Also provides site preparation procedures, troubleshooting procedures, maintenance procedures, cable and connector specifications, and basic Cisco IOS configuration information.
Cisco PNNI Network Planning Guide for MGX and SES Products OL-3847-01	Provides guidelines for planning a PNNI network that uses Cisco MGX 8830, Cisco MGX 8850 (PXM45 and PXM1E), Cisco MGX 8950, or Cisco BPX 8600 switches or the MGX 8880 Media Gateway. When connected to a PNNI network, each Cisco BPX 8600 Series switch requires an SES for PNNI route processing.
Cisco Service Expansion Shelf Hardware Installation Guide, Release 1 DOC-786122=	Provides instructions for installing and maintaining an SES controller.
Cisco SES PNNI Controller Command Reference, Release 3 DOC-7814260=	Describes the commands used to configure and operate the SES PNNI controller.
Cisco SES PNNI Controller Software Configuration Guide, Release 3 DOC-7814258=	Describes how to configure, operate, and maintain the SES PNNI controller.
Cisco Voice Interworking Services (VISM) Configuration Guide and Command Reference, Release 3.3 OL-5358-01	Describes how to install and configure the Voice Interworking Service Module (VISM) in the Cisco MGX 8830, Cisco MGX 8850 (PXM45), and Cisco MGX 8850 (PXM1E) multiservice switches. Provides site preparation procedures, troubleshooting procedures, maintenance procedures, cable and connector specifications, and Cisco CLI configuration information.

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Table 5 User Guides and Release Notes for Cisco Multiservice Switch Products (continued)

Document Title	Description
Cisco Voice Switch Services (VXSM) Configuration and Command Reference Guide for MGX Switches, Release 5 OL-4625-01	Describes the features and functions of the new Voice Switch Service Module (VXSM) in the Cisco MGX 8880 Media Gateway and in the Cisco MGX8850 (PXM45 and PXM1E) multiservice switches. Also provides configuration procedures, troubleshooting procedures, and Cisco CLI configuration information.
Cisco WAN Manager Database Interface Guide, Release 15.3.00 OL-6261-01	Provides information about accessing the CWM Informix database that is used to store information about the network elements.
Cisco WAN Manager Installation Guide, Release 15.3.00 OL-6259-01	Provides procedures for installing Release 15.1 of the CWM network management system.
Cisco WAN Manager SNMP Service Agent, Release 15.3.00 OL-6260-01	Provides information about the CWM Simple Network Management Protocol service agent, an optional adjunct to CWM that is used for managing Cisco WAN switches through SNMP.
Cisco WAN Manager User's Guide, Release 15.3.00 OL-6257-01	Describes how to use the CWM Release 15.1 software, which consists of user applications and tools for network management, connection management, network configuration, statistics collection, and security management. **Note** The CWM interface now has built-in documentation support in the form of online Help. On a PC, press **F1** to access Help; on a UNIX workstation, press the **Help** key. Alternatively, on either system you can select **Help** from the main or popup menu.
Frame Relay Software Configuration Guide and Command Reference for the Cisco MGX 8850 FRSM12 Card, Release 3 DOC-7810327=	Describes how to use the high-speed Frame Relay (FRSM-12-T3E3) commands that are available in the CLI of the Cisco MGX 8850 (PXM45) switch.
Release Notes for Cisco MGX 8230, Cisco MGX 8250, and Cisco MGX 8850 (PXM1) Switches, Release 1.3.14 OL-4539-01	Provides new feature, upgrade, and compatibility information, as well as information about known and resolved anomalies.
Release Notes for Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8950, and Cisco MGX 8830 Switches, Release 5.3.00 OL-6478-01	Provides new feature, upgrade, and compatibility information, as well as information about known and resolved anomalies.
Release Notes for the Cisco MGX 8880 Media Gateway, Release 5.3.00 OL-6493-01	Provides new feature and compatibility information, as well as information about known and resolved anomalies.
Release Notes for Cisco MGX Route Processor Module (RPM-PR) IOS Release 12.4(6)T1 for MGX Releases 1.3.14 and 5.3.00 OL-7292-01	Provides upgrade and compatibility information, as well as information about known and resolved anomalies.

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Table 5 User Guides and Release Notes for Cisco Multiservice Switch Products (continued)

Document Title	Description
Release Notes for Cisco MGX Route Processor Module (RPM-XF) IOS Release 12.4(6)T1 for PXM45-based Switches, Release 5.3.00 OL-7059-01	Provides upgrade and compatibility information, as well as information about known and resolved anomalies.
Release Notes for the Cisco Voice Interworking Service Module (VISM), Release 3.3.25 OL-5357-01	Provides new feature, upgrade, and compatibility information, as well as information about known and resolved anomalies.
Release Notes for the Cisco Voice Switch Service Module (VXSM), Release 5.3.00 OL-7088-01	Provides new feature, upgrade, and compatibility information, as well as information about known and resolved anomalies.
Release Notes for Cisco WAN Manager, Release 15.3.00 OL-6495-01	Provides new feature, upgrade, and compatibility information, as well as information about known and resolved anomalies.

Obtaining Documentation

Cisco documentation and additional literature are available on Cisco.com. Cisco also provides several ways to obtain technical assistance and other technical resources. These sections explain how to obtain technical information from Cisco Systems.

Cisco.com

You can access the most current Cisco documentation at this URL:

http://www.cisco.com/techsupport

You can access the Cisco website at this URL:

http://www.cisco.com

You can access international Cisco websites at this URL:

http://www.cisco.com/public/countries_languages.shtml

Product Documentation DVD

The Product Documentation DVD is a comprehensive library of technical product documentation on a portable medium. The DVD enables you to access multiple versions of installation, configuration, and command guides for Cisco hardware and software products. With the DVD, you have access to the same HTML documentation that is found on the Cisco website without being connected to the Internet. Certain products also have .PDF versions of the documentation available.

The Product Documentation DVD is available as a single unit or as a subscription. Registered Cisco.com users (Cisco direct customers) can order a Product Documentation DVD (product number DOC-DOCDVD= or DOC-DOCDVD=SUB) from Cisco Marketplace at this URL:

http://www.cisco.com/go/marketplace/

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Registered Cisco.com users may order Cisco documentation at the Product Documentation Store in the Cisco Marketplace at this URL:

http://www.cisco.com/go/marketplace/

Nonregistered Cisco.com users can order technical documentation from 8:00 a.m. to 5:00 p.m. (0800 to 1700) PDT by calling 1 866 463-3487 in the United States and Canada, or elsewhere by calling 011 408 519-5055. You can also order documentation by e-mail at tech-doc-store-mkpl@external.cisco.com or by fax at 1 408 519-5001 in the United States and Canada, or elsewhere at 011 408 519-5001.

Documentation Feedback

You can rate and provide feedback about Cisco technical documents by completing the online feedback form that appears with the technical documents on Cisco.com.

You can submit comments about Cisco documentation by using the response card (if present) behind the front cover of your document or by writing to the following address:

Cisco Systems
Attn: Customer Document Ordering
170 West Tasman Drive
San Jose, CA 95134-9883

We appreciate your comments.

Cisco Product Security Overview

Cisco provides a free online Security Vulnerability Policy portal at this URL:

http://www.cisco.com/en/US/products/products_security_vulnerability_policy.html

From this site, you will find information about how to:

- Report security vulnerabilities in Cisco products.
- Obtain assistance with security incidents that involve Cisco products.
- Register to receive security information from Cisco.

A current list of security advisories, security notices, and security responses for Cisco products is available at this URL:

http://www.cisco.com/go/psirt

To see security advisories, security notices, and security responses as they are updated in real time, you can subscribe to the Product Security Incident Response Team Really Simple Syndication (PSIRT RSS) feed. Information about how to subscribe to the PSIRT RSS feed is found at this URL:

http://www.cisco.com/en/US/products/products_psirt_rss_feed.html

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Reporting Security Problems in Cisco Products

Cisco is committed to delivering secure products. We test our products internally before we release them, and we strive to correct all vulnerabilities quickly. If you think that you have identified a vulnerability in a Cisco product, contact PSIRT:

- For Emergencies only—security-alert@cisco.com

  An emergency is either a condition in which a system is under active attack or a condition for which a severe and urgent security vulnerability should be reported. All other conditions are considered nonemergencies.

- For Nonemergencies—psirt@cisco.com

In an emergency, you can also reach PSIRT by telephone:

- 1 877 228-7302
- 1 408 525-6532

Tip We encourage you to use Pretty Good Privacy (PGP) or a compatible product (for example, GnuPG) to encrypt any sensitive information that you send to Cisco. PSIRT can work with information that has been encrypted with PGP versions 2.*x* through 9.*x*.

Never use a revoked or an expired encryption key. The correct public key to use in your correspondence with PSIRT is the one linked in the Contact Summary section of the Security Vulnerability Policy page at this URL:

http://www.cisco.com/en/US/products/products_security_vulnerability_policy.html

The link on this page has the current PGP key ID in use.

If you do not have or use PGP, contact PSIRT at the aforementioned e-mail addresses or phone numbers before sending any sensitive material to find other means of encrypting the data.

Obtaining Technical Assistance

Cisco Technical Support provides 24-hour-a-day award-winning technical assistance. The Cisco Technical Support & Documentation website on Cisco.com features extensive online support resources. In addition, if you have a valid Cisco service contract, Cisco Technical Assistance Center (TAC) engineers provide telephone support. If you do not have a valid Cisco service contract, contact your reseller.

Cisco Technical Support & Documentation Website

The Cisco Technical Support & Documentation website provides online documents and tools for troubleshooting and resolving technical issues with Cisco products and technologies. The website is available 24 hours a day, at this URL:

http://www.cisco.com/techsupport

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Access to all tools on the Cisco Technical Support & Documentation website requires a Cisco.com user ID and password. If you have a valid service contract but do not have a user ID or password, you can register at this URL:

http://tools.cisco.com/RPF/register/register.do

Note Use the Cisco Product Identification (CPI) tool to locate your product serial number before submitting a web or phone request for service. You can access the CPI tool from the Cisco Technical Support & Documentation website by clicking the **Tools & Resources** link under Documentation & Tools. Choose **Cisco Product Identification Tool** from the Alphabetical Index drop-down list, or click the **Cisco Product Identification Tool** link under Alerts & RMAs. The CPI tool offers three search options: by product ID or model name; by tree view; or for certain products, by copying and pasting **show** command output. Search results show an illustration of your product with the serial number label location highlighted. Locate the serial number label on your product and record the information before placing a service call.

Submitting a Service Request

Using the online TAC Service Request Tool is the fastest way to open S3 and S4 service requests. (S3 and S4 service requests are those in which your network is minimally impaired or for which you require product information.) After you describe your situation, the TAC Service Request Tool provides recommended solutions. If your issue is not resolved using the recommended resources, your service request is assigned to a Cisco engineer. The TAC Service Request Tool is located at this URL:

http://www.cisco.com/techsupport/servicerequest

For S1 or S2 service requests, or if you do not have Internet access, contact the Cisco TAC by telephone. (S1 or S2 service requests are those in which your production network is down or severely degraded.) Cisco engineers are assigned immediately to S1 and S2 service requests to help keep your business operations running smoothly.

To open a service request by telephone, use one of the following numbers:

Asia-Pacific: +61 2 8446 7411 (Australia: 1 800 805 227)
EMEA: +32 2 704 55 55
USA: 1 800 553-2447

For a complete list of Cisco TAC contacts, go to this URL:

http://www.cisco.com/techsupport/contacts

Definitions of Service Request Severity

To ensure that all service requests are reported in a standard format, Cisco has established severity definitions.

Severity 1 (S1)—An existing network is down, or there is a critical impact to your business operations. You and Cisco will commit all necessary resources around the clock to resolve the situation.

Severity 2 (S2)—Operation of an existing network is severely degraded, or significant aspects of your business operations are negatively affected by inadequate performance of Cisco products. You and Cisco will commit full-time resources during normal business hours to resolve the situation.

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Severity 3 (S3)—Operational performance of the network is impaired, while most business operations remain functional. You and Cisco will commit resources during normal business hours to restore service to satisfactory levels.

Severity 4 (S4)—You require information or assistance with Cisco product capabilities, installation, or configuration. There is little or no effect on your business operations.

Obtaining Additional Publications and Information

Information about Cisco products, technologies, and network solutions is available from various online and printed sources.

- The *Cisco Product Quick Reference Guide* is a handy, compact reference tool that includes brief product overviews, key features, sample part numbers, and abbreviated technical specifications for many Cisco products that are sold through channel partners. It is updated twice a year and includes the latest Cisco offerings. To order and find out more about the Cisco Product Quick Reference Guide, go to this URL:

  http://www.cisco.com/go/guide

- Cisco Marketplace provides a variety of Cisco books, reference guides, documentation, and logo merchandise. Visit Cisco Marketplace, the company store, at this URL:

  http://www.cisco.com/go/marketplace/

- *Cisco Press* publishes a wide range of general networking, training and certification titles. Both new and experienced users will benefit from these publications. For current Cisco Press titles and other information, go to Cisco Press at this URL:

  http://www.ciscopress.com

- *Packet* magazine is the Cisco Systems technical user magazine for maximizing Internet and networking investments. Each quarter, Packet delivers coverage of the latest industry trends, technology breakthroughs, and Cisco products and solutions, as well as network deployment and troubleshooting tips, configuration examples, customer case studies, certification and training information, and links to scores of in-depth online resources. You can access Packet magazine at this URL:

  http://www.cisco.com/packet

- *iQ Magazine* is the quarterly publication from Cisco Systems designed to help growing companies learn how they can use technology to increase revenue, streamline their business, and expand services. The publication identifies the challenges facing these companies and the technologies to help solve them, using real-world case studies and business strategies to help readers make sound technology investment decisions. You can access iQ Magazine at this URL:

  http://www.cisco.com/go/iqmagazine

  or view the digital edition at this URL:

  http://ciscoiq.texterity.com/ciscoiq/sample/

- *Internet Protocol Journal* is a quarterly journal published by Cisco Systems for engineering professionals involved in designing, developing, and operating public and private internets and intranets. You can access the Internet Protocol Journal at this URL:

  http://www.cisco.com/ipj

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- Networking products offered by Cisco Systems, as well as customer support services, can be obtained at this URL:

  http://www.cisco.com/en/US/products/index.html

- Networking Professionals Connection is an interactive website for networking professionals to share questions, suggestions, and information about networking products and technologies with Cisco experts and other networking professionals. Join a discussion at this URL:

  http://www.cisco.com/discuss/networking

- World-class networking training is available from Cisco. You can view current offerings at this URL:

  http://www.cisco.com/en/US/learning/index.html

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Product Overviews

Figure 1-1 and Figure 1-2 show the Cisco MGX family switches and the Cisco MGX media gateway, respectively:

- Cisco MGX 8850 or Cisco MGX 8850/B switch
- Cisco MGX 8950 switch
- Cisco MGX 8830 switch, Cisco MGX 8830/B switch

Figure 1-1 Cisco MGX Switch Family

The Cisco MGX 8850 Multiservice Switch is designed for service providers deploying narrowband and/or broadband services. The MGX 8850/B model supports 1:N redundancy.

Both the MGX 8850 and MGX 8850/B support either the PXM45 or PXM1E controller cards. Further, the switches can scale from DS0 to OC-48c/STM-16 and support any combination of the following services:

- Frame relay
- ATM
- Voice over ATM
- Voice over IP

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- Circuit emulation
- IP
- Wireless aggregation
- DSL aggregation
- ATM service backbones

The Cisco MGX 8950 ATM multiservice switch scales service provider networks by providing 180 Gbps of redundant switching with 10 Gbps ATM interfaces.

The Cisco MGX 8830 ATM multiservice switch extends a full suite of narrowband interfaces and broadband trunking to remote sites with low density and high service mix requirements. Using PNNI and MPLS, the MGX 8830 provides a flexible network for services evolution. With a switching capacity of up to 1.2 Gbps, the MGX 8830 acts as a standalone switch, offering a full range of service interfaces. The MGX 8850/B model supports all of the same features with 1:N redundancy.

The Cisco MGX 8880 Media Gateway is part of the Cisco IP/MPLS product portfolio that offers service providers the capability to consolidate their core infrastructure and deliver differentiated IP Communications services. With superior density, scalability, and performance, the Cisco MGX 8880 Media Gateway helps service providers to deploy a comprehensive set of voice over IP (VoIP) applications that help lower operational expenses and generate new services revenue. The DC version of this gateway allows three gateways to fit in a rack.

Figure 1-2 MGX 8880 Media Gateway

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Changes to this Document

Table 1-1 summarizes the changes made to this document since Release 5.

Table 1-1 Changes to This Guide Since Release 5

Section	Status	Description
APS connector sections in Chapters 1, 5, and 6.	Modified	Updated APS connector illustrations for the MGX 8950, MGX 8850, MGX 8830, and MGX 8880 to show the correct connector and APS assemblies.
Service module sections in Chapters 1 and 2.	Modified	Added AXSM-8-622-XG to the MGX 8950, MGX 8850, MGX 8830, and MGX 8880 compatibility tables.
Table 1-3, "Valid Card Installation Options," on page 7	Modified	Updated compatibility information for front cards, back ards, and valid slots.
MGX 8830/B (PXM45/C) Card Overview, page 2-6	New	Created separate section for the cards supported on the MGX 8830/B with the PXM45/C controller.
MGX 8880 Card Overview, page 2-8	Modified	Removed unsupported cards: AXSM-2-622-E, AXSM-8-155-E , and AXSM-16-T3E3-E.
MGX-RJ45-5-ETH, page 2-111	New	Added MGX-RJ45-5ETH back card for the RPM-PR.
Installing or Removing Redundancy Connectors, page 6-22	New	New procedures for installation or removal of MGX 8850/B and MGX 8830/B RCONs
Installing and Removing the AXSM-XG Extender Connector, page 6-27	New	New procedures for installation or removal of MGX 8950 extender connector for AXSM-XG cards.
Illustrated Cable Guide, page B-25	Modified	Added cable information for MPSM cards.
All	New/Modified	Updated numerous sections within guide to support release 5.1 and 5.2 features including the VXSM-T3 card set introduced in release 5.2. See the Release Notes for more information.

How this Chapter Is Organized

This chapter provides an overview of terms and a description of each switch or gateway and its related components.

Each switch description contains the following sections:

- An introduction to the switch or gateway, including information on the cards that are supported in the chassis
- A description of the card compartment and slot assignments
- A description of system hardware components

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Overview of Terms

Each acronym in this book is defined on its first use and in the Glossary at the end of the guide. Types of cards are also defined in the Glossary. For example, *MCC* is miniature coaxial cable.

In addition to the Glossary, you may find the following discussion of terms helpful.

MGX switches are called *multiservice* switches, because they can be used for multiple services, such as Asynchronous Transfer Mode (ATM) or Frame Relay (FR) transmissions. Each switch can also be used in different parts of a network. For example, the MGX 8950 can be at the core, the MGX 8850 (PXM45) can be used at the edge, the MGX 8850 (PXM1E) and MGX 8830 switches can do Private Network-to-Network Interface (PNNI) routing and function as feeders.

As of this printing, you can find information about the features of each switch in either of the following ways:

- Go to www.cisco.com and search for the switch name.
- Go to http://www.cisco.com/en/US/products/hw/switches/ps1938/index.html and click on "Cisco MGX 8000 Series Switches".

MGX

MGX originally stood for *media gateway switch*, and over time, the MGX family has grown in speed, utility, and functionality as described throughout this guide.

Each MGX switch name is a trademark of Cisco (for example, *Cisco MGX 8950*). But for convenience, in this book, the switch name is often shortened (for example, MGX 8950).

Processor Cards

Each MGX switch or gateway requires a *processor switching module* (PXM) controller card. Starting with Release 3, there were three models of MGX 8850 switches, so for clarity, the controller card was added to the MGX 8850 switch name, when applicable. For example, *MGX 8850 (PXM1)*, *MGX 8850 (PXM45)*, and *MGX 8850 (PXM1E)*.

Table 1-2 shows the processor cards supported for each model of switch and the 8880 Media Gateway.

Table 1-2 Processor Card Support

	Supports			
Model	**PXM1E**	**PXM45/B[1]**	**PXM45/C[1]**	**Release**
8850		x		Release 2 and above.
			x	Release 4 and above.
	x			Release 3 and above.
8850/B		x	x	Release 5.1 and above.
8950		x	x	Release 2.1 and above.
8830	x			Release 3 and above.
8830/B	x		x	Release 5.1 and above.
8880			x	Release 5 and above.

1. In this guide, collectively referred to as PXM45, unless otherwise specified.

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Note The information in this guide does not apply to the Cisco MGX 8850 (PXM1), which uses the PXM1 controller card and Release 1.X software.

For documentation on Cisco MGX Release 1.x software and hardware, refer to http://www.cisco.com/univercd/cc/td/doc/product/wanbu/mgx8850/index.htm.

Multiple Terms

Inside and outside of Cisco, several terms are often used for the same thing. Here are some examples:

- MGX switches contain printed circuit cards called *front cards* and *back cards.* Cards are also called *blades*, *modules,* or *boards*. A controller card is sometimes simply called a *controller*. In this guide, the terms *module* is used for a front card and *card* is used for every other type of card.
- An interconnect device that enables redundant operation between cards is called a *midplane*, an automatic protection switching *(APS) backplane connector*, or an APS connector. An additional type of connector that enables redundancy is a *redundancy connector* (RCON).
- Single-height slots can be converted to double-height slots by removing the *center guide modules*. Center guide modules are also called *center guides*, *midrail dividers, or service module slot divider assemblies.* In this guide, the term *center guide module* is used.
- In the back of the switch, back cards go into bays. The *upper bay* is also called *Bay 1*, and the *lower bay* is also called *Bay 2*. Figure 1-3 shows the bay and line numbers for an MGX 8850 switch.
- The MP port on the back of the PXM-UI-S3 user interface back card stands for *maintenance port* or *modem port*. The CP port on the back of the PXM-UI-S3 user interface back card stands for *control port* or *console port.*

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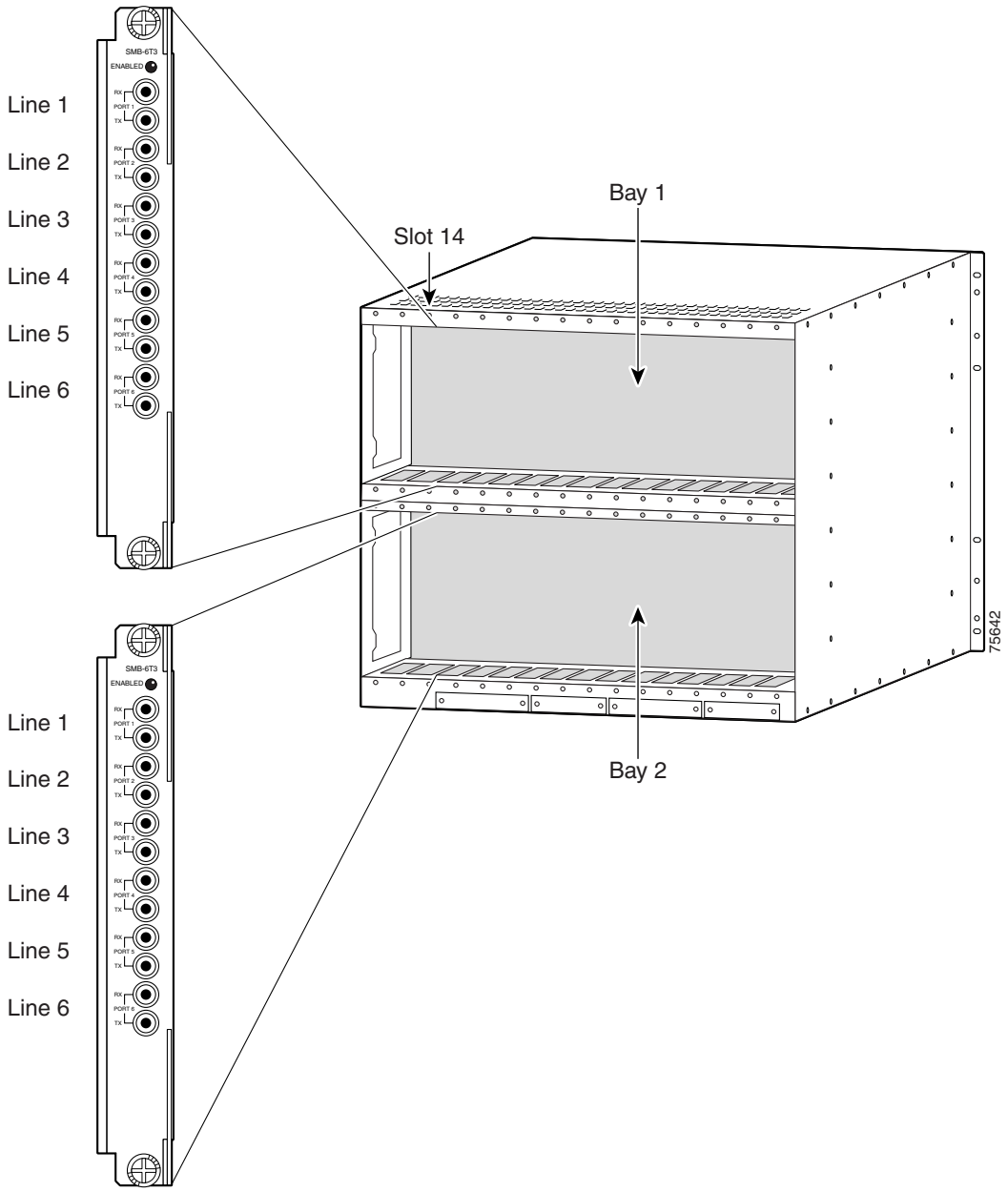
Figure 1-3 Bay and Line Numbers in an MGX 8850 Switch



Narrow Band and Cell Bus Service Modules

A cell bus service module (CBSM) is an MGX service module that uses the MGX cell bus to transport customer traffic between that service module and other service modules or PXM uplinks. Traditionally, the CBSM cards were called narrow band service modules (NBSMs) because some AXSM cards (which use the MGX serial bus) support higher rate communications. AXSM cards run only in MGX 2 (and later) switches, and until MGX Release 3, the CBSM cards ran only in MGX 8850 (PXM1). So the purpose of the NBSM term was to collectively refer to all cards that ran in MGX 8850 (PXM1) and MGX

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8820, because there were several types of these cards (for example AUSM, FRSM, CESM, and so forth). The serial bus service modules (AXSM and FRSM-12-T3E3) run only in MGX Release 2 and higher switches, hence the reason to differentiate between the two groups of cards.

Now that AXSM cards support narrow band rates and new CBSM cards are being developed for high-speed communications, the narrow- or wideband distinction is inappropriate and could be confusing. For example, one might think that a reference to NBSM cards includes the T1E1 AXSM cards because these cards support narrow band rates (AXSM cards use the serial bus). Although there are many differences between the AXSM and the CBSM, the port speed is no longer a clear differentiator. However, the bus used by AXSM cards and CBSM cards can be used to accurately differentiate between these two classes of cards.

Therefore, in this guide, CBSM is used to collectively refer to all the cards that use the cell bus for communications. Some CBSM cards run on the MGX 8850 (PXM1) and MGX 8820 products, and some are not supported on MGX Release 2 or have become obsolete.

Overview of Card Slot Assignments, by Chassis

As shown in Figure 1-3, the locations where the upper and lower back cards are installed are also called *bays*. On a Cisco MGX 8850 switch, a Cisco MGX 8950 switch, or a Cisco MGX 8880 Media Gateway, each slot has an upper and a lower bay for back cards.

Table 1-3 lists the valid slot numbers of the front cards (or modules) and back cards. Slot information is listed by chassis.

Note The initial *R-* on some back cards means that this is a *redundant* back card, which is used for 1:N card set redundancy without bulk distribution.

Caution The card and slot arrangements in Table 1-3 are called *valid card installation options*, because other arrangements are *not* valid and can actually damage your chassis. For example, it is very important to insert the processor cards such as PXM45 or PXM1E into the correct slot for the switch!

Table 1-3 Valid Card Installation Options

Front Card Type	Description	Back Card Types	Valid Back Card Bay Locations	MGX 8830[1] Valid Slot Numbers	MGX 8850[2] Valid Slot Numbers	MGX 8880 Valid Slot Numbers	MGX 8950 Valid Slot Numbers
AUSM8E1/B	8 port ATM Universal Service Modules with E1 interfaces	RJ48-8E1 MGX-RJ48-8E1[3] R-RJ48-8E1 SMB-8E1 R-SMB-8E1	Upper and lower	3-6, 10-13[4]	1-6, 9-14, 17-22, 25-30[5]	—	—
AUSM8T1/B	8 port ATM Universal Service Modules with T1 interfaces	RJ48-8T1 R-RJ48-8T1	Upper and lower	3-6, 10-13[4]	1-6, 9-14, 17-22, 25-30[5,6]	—	—

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Table 1-3 Valid Card Installation Options (continued)

Front Card Type	Description	Back Card Types	Valid Back Card Bay Locations	MGX 8830[1] Valid Slot Numbers	MGX 8850[2] Valid Slot Numbers	MGX 8880 Valid Slot Numbers	MGX 8950 Valid Slot Numbers
AXSM-1-2488[7]	1 port OC-48/STM-64 **Note** No traffic shaping supported.	SMFSR-1-2488 SMFLR-1-2488 SMFXLR-1-2488	Upper	—	1–6, 9–14[13]	—	—
AXSM-1-2488/B[7]	1 port OC-48/STM-16 **Note** No traffic shaping supported.	SMFSR-1-2488/B SMFLR-1-2488/B SMFXLR-1-2488/B	Upper	—	1–6, 9–14[13]	1–6, 9–14	1-6, 11-16
AXSM-1-9953-XG[7]	1-port OC192/STM-64	SMFSR-1-9953 SMFIR-1-9953 SMFLR-1-9953 SMFXLR-1-9953	Upper and lower[7]	—	—	—	1-6, 11-16
AXSM-2-622-E[7]	2-port OC-12/STM-4 (622 Mbps)	SMFIR-1-622/C SMFLR-1-622/C	Upper and lower	3-6, 10-13[8]	1–6, 9–14[13]	1–6, 9–14	—
AXSM-4-622[7]	4-port OC-12	SMFIR-2-622 SMFLR-2-622	Upper and lower	—	1–6, 9–14[13]	—	—
AXSM-4-622/B[7]	4-port OC-12	SMFIR-2-622/B SMFLR-2-622/B	Upper and lower	—	1–6, 9–14[13]	1–6, 9–14	1-6, 11-16[7]
AXSM-8-622-XG[7]	8-port OC-12	SFP-4-622	Upper and lower	3-6, 10-13[8]	1–6, 9–14[13]	—	1-6, 11-16[9]
AXSM-4-2488-XG[7]	4 port OC-48/STM-16 (clear or channelized to DS3)	SMFSR-4-2488-SFP This card supports the following FRUs: • SMFSR-1-2488-SFP • SMFLR-1-2488-SFP	Upper and lower[7]	—	—	—	1-6, 11-16
AXSM-8-155-E[7]	8-port OC-3/STM-1 (155 Mbps)	MMF-4-155-MT/B SMFIR-4-155-LC/B SMFLR-4-155-LC/B SMB-4-155	Upper and lower	—	1–6, 9–14[13]	1–6, 9–14	—

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Table 1-3 Valid Card Installation Options (continued)

Front Card Type	Description	Back Card Types	Valid Back Card Bay Locations	MGX 8830[1] Valid Slot Numbers	MGX 8850[2] Valid Slot Numbers	MGX 8880 Valid Slot Numbers	MGX 8950 Valid Slot Numbers
AXSM-16-155[7]	16-port OC-3	MMF-8-155-MT MMF-8-155-MT/B SMFIR-8-155-LC SMFIR-8-155-LC/B SMFLR-8-155-LC SMFLR-8-155-LC/B	Upper and lower	—	1–6, 9–14[13]	—	—
AXSM-16-155/B[7]	16-port OC-3	SMB-4-155 MMF-8-155-MT/B SMFIR-8-155-LC/B SMFLR-8-155-LC/B	Upper and lower	—	1–6, 9–14[13]	1–6, 9–14	1-6, 11-16
AXSM-16-155-XG[7]	16-port OC-3	MCC-8-155 SFP-8-155 The SFP-8-155 card supports the following FRUs: • SMFIR-1-155-SFP • SMFLR-1-155-SFP	Upper and lower	3-6, 10-13[8]	1–6, 9–14[13]	—	1-6, 11-16[9]
AXSM-16-T3E3[7]	16-port T3/E3	SMB-8-T3 SMB-8-E3	Upper and lower	—	1–6, 9–14[13]	—	—
AXSM-16-T3E3/B[7]	16-port T3/E3	SMB-8-T3 SMB-8-E3	Upper and lower	—	1–6, 9–14[13]	1–6, 9–14	1-6, 11-16
AXSM-16-T3E3-E[7]	16-port T3/E3	SMB-8-T3 SMB-8-E3	Upper and lower	3-6, 10-13[8]	1–6, 9–14[13]	1–6, 9–14	—
AXSM-32-T1E1-E[7]	32-port T1/E1	MCC8-16-E1 RBBN8-16-T1E1	Upper and lower	—	1–6, 9–14[13]	1–6, 9–14	—
CESM-8E1	8 port Circuit Emulation Service Module with E1 interfaces	RJ48-8E1 R-RJ48-8E1 MGX-RJ48-8E1[3] SMB-8E1 R-SMB-8E1	Upper and lower	3-6, 10-13[4]	1-6, 9-14, 17-22, 25-30[5]	—	—
CESM-8T1	8 port Circuit Emulation Service Module with T1 interfaces	RJ48-8T1 R-RJ48-8T1	Upper and lower	—	1-6, 9-14, 17-22, 25-30[5, 13]	—	—

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Table 1-3 Valid Card Installation Options (continued)

Front Card Type	Description	Back Card Types	Valid Back Card Bay Locations	MGX 8830[1] Valid Slot Numbers	MGX 8850[2] Valid Slot Numbers	MGX 8880 Valid Slot Numbers	MGX 8950 Valid Slot Numbers
CESM-8T1/B	8 port Circuit Emulation Service Module with T1 interfaces	RJ48-8T1 R-RJ48-8T1	Upper and lower	3-6, 10-13[4]	1-6, 9-14, 17-22, 25-30[5]	—	—
FRSM-12-T3E3[7]	12-port T3/E3	SMB-6-T3E3	Upper and lower	—	1–6, 9–14[13]	—	—
FRSM-2CT3	2 port channelized Frame Relay Service Module with T3 interfaces	MGX-BNC-2T3	Upper and lower	3-6, 10-13[4]	1-6, 9-14, 17-22, 25-30[5]	—	—
FRSM-8E1	8 port Frame Relay Service Modules with E1 interfaces	RJ48-8E1 MGX-RJ48-8E1[3] R-RJ48-8E1 SMB-8E1 R-SMB-8E1	Upper and lower	3-6, 10-13[4]	1-6, 9-14, 17-22, 25-30[5]	—	—
FRSM-8E1-C	8 port channelized Frame Relay Service Module with E1 interfaces	RJ48-8E1 MGX-RJ48-8E1[3] R-RJ48-8E1 SMB-8E1 R-SMB-8E1	Upper and lower	3-6, 10-13[4]	1-6, 9-14, 17-22, 25-30[5]	—	—
FRSM-8T1	8 port Frame Relay Service Modules with T1 interfaces	RJ48-8T1 R-RJ48-8T1	Upper and lower	3-6, 10-13[4]	1-6, 9-14, 17-22, 25-30[5]	—	—
FRSM-8T1-C	8 port channelized Frame Relay Service Module with T1 interfaces	RJ48-8T1 R-RJ48-8T1	Upper and lower	3-6, 10-13[4]	1-6, 9-14, 17-22, 25-30[5]	—	—
FRSM-HS2/B	2 port Frame Relay Service Module with HSSI interfaces	SCS12-2HSSI/B MGX-121N1-8S	Upper and lower	3-6, 10-13[6]	1-6, 9-14, 17-22, 25-30[5]	—	—

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Table 1-3 Valid Card Installation Options (continued)

Front Card Type	Description	Back Card Types	Valid Back Card Bay Locations	MGX 8830[1] Valid Slot Numbers	MGX 8850[2] Valid Slot Numbers	MGX 8880 Valid Slot Numbers	MGX 8950 Valid Slot Numbers
MPSM-8-T1E1	8 ATM service ports with E1 interfaces	RJ48-8E1 MGX-RJ48-8E1[3] R-RJ48-8E1 SMB-8E1 R-SMB-8E1	Upper and lower	3-6, 10-13	1-6, 9-14, 17-22, 25-30[5]	—	—
	8 ATM service ports with T1 interfaces	RJ48-8T1 R-RJ48-8T1	Upper and lower	3-6, 10-13	1-6, 9-14, 17-22, 25-30[5]	—	—
	8 Frame Relay service ports with E1 interfaces	RJ48-8E1 MGX-RJ48-8E1[3] R-RJ48-8E1 SMB-8E1 R-SMB-8E1	Upper and lower	3-6, 10-13	1-6, 9-14, 17-22, 25-30[5]	—	—
	8 Frame Relay service ports with T1 interfaces	RJ48-8T1 R-RJ48-8T1	Upper and lower	3-6, 10-13	1-6, 9-14, 17-22, 25-30[5]	—	—
	8 circuit emulation service ports with E1 interfaces	RJ48-8E1 MGX-RJ48-8E1[3] R-RJ48-8E1 SMB-8E1 R-SMB-8E1	Upper and lower	3-6, 10-13	1-6, 9-14, 17-22, 25-30[5]	—	—
	8 circuit emulation service ports with T1 interfaces	RJ48-8T1 R-RJ48-8T1	Upper and lower	3-6, 10-13	1-6, 9-14, 17-22, 25-30[5]	—	—
MPSM-16-T1E1	16 port service module for ATM and Frame Relay services over T1 or E1 interfaces.[10]	RBBN-16-T1E1 RBBN-16-T1E1-1N RED-16-T1E1[11]	Upper and lower	3-6, 10-13[12]	1-6, 9-14, 17-22, 25-30[12]	—	—
	16 port service module for ATM and Frame Relay services over T1 or E1 electrical interfaces.[10]	MCC-16-E1 MCC-16-E1-1N [11] RED-16-T1E1	Upper and lower	3-6, 10-13[12]	1-6, 9-14, 17-22, 25-30[12]	—	—

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Table 1-3 Valid Card Installation Options (continued)

Front Card Type	Description	Back Card Types	Valid Back Card Bay Locations	MGX 8830[1] Valid Slot Numbers	MGX 8850[2] Valid Slot Numbers	MGX 8880 Valid Slot Numbers	MGX 8950 Valid Slot Numbers
MPSM-T3E3-155	2 port service module for ATM and Frame Relay services over OC-3 interfaces.	SFP-2-155	Upper and lower	3-6, 10-13	1-6, 9-14, 17-22, 25-30	—	—
	2 port service module for ATM and Frame Relay services over OC-3 electrical interfaces.	SMB-2-155-EL	Upper and lower	3-6, 10-13	1-6, 9-14, 17-22, 25-30	—	—
	3 port service module for ATM and Frame Relay services over T3 and E3 electrical interfaces.	BNC-3-T3E3	Upper and lower	3-6, 10-13	1-6, 9-14, 17-22, 25-30	—	—
PXM1E-4-155[7]	Processor Switch Module 4-port OC-3	PXM-UI-S3/B	Upper	1 and 2	7 and 8	—	—
		MMF-4-155/C SMFIR-4-155/C SMFLR-4-155/C	Lower				
PXM1E-8-155[7]	Processor Switch Module 8-port OC-3	PXM-UI-S3/B	Upper	1 and 2	7 and 8	—	—
		SFP-8-155 MCC-8-155 Transceivers: • MMF-1-155-SFP • SMFLR-1-155-SFP • SMFIR-1-155-SFP	Lower				
PXM1E-8-T3E3[7]	Processor Switch Module 8-port T3/E3	PXM-UI-S3/B	Upper	1 and 2	7 and 8	—	—
		SMB-8-T3 SMB-8-E3	Lower				
PXM1E-16-T1E1[7]	Processor Switch Module 16-port T1/E1	PXM-UI-S3/B	Upper	1 and 2	7 and 8	—	—
		MCC-16-E1 RBBN-16-T1E1	Lower				

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Table 1-3 Valid Card Installation Options (continued)

Front Card Type	Description	Back Card Types	Valid Back Card Bay Locations	MGX 8830[1] Valid Slot Numbers	MGX 8850[2] Valid Slot Numbers	MGX 8880 Valid Slot Numbers	MGX 8950 Valid Slot Numbers
PXM1E-COMBO[7]	Processor Switch Module 4-port OC-3, 8-port T3/E3	PXM-UI-S3/B	Upper	1 and 2	7 and 8	—	—
		MGX-T3E3-155 Transceivers: • MMF-1-155-SFP • SMFLR-1-155-SFP • SMFIR-1-155-SFP	Lower				
PXM45[7]	Processor Switch Module	UI Stratum-3	Upper	—	7 and 8	—	—
		PXM Hard Disk Drive	Lower				
PXM45/B[7]	Processor Switch Module	UI Stratum-3	Upper	—	7 and 8	—	7 and 8
		PXM Hard Disk Drive	Lower				
PXM45/C[7]	Processor Switch Module	UI Stratum-3/B	Upper	—	7 and 8	7 and 8	7 and 8
		PXM Hard Disk Drive	Lower				
RPM-PR-256[7] RPM-PR-512[7]	Route Processor Module	MGX-RJ45-4E/B MGX-RJ45-FE MGX-MMF-FE MGX-RPM-1FE-CP MGX-RJ45-5-ETH	Upper and lower	3-6	1-6, 9-14	1-6, 9-14	1-6, 11-16
RPM-XF-512[7,13]	Route Processor Module	Lower Bay: • MGX-XF-UI Upper Bay: • MGX-1OC12POS-IR • MGX-2OC12POS-IR • MGX-1GE • MGX-2GE **Note** Back cards are optional with the RPM-XF.	According to back card type	3-6	1-6, 9-14	1-6 permitted, 9-14 preferred	1-6, 11-16

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Table 1-3 Valid Card Installation Options (continued)

Front Card Type	Description	Back Card Types	Valid Back Card Bay Locations	MGX 8830[1] Valid Slot Numbers	MGX 8850[2] Valid Slot Numbers	MGX 8880 Valid Slot Numbers	MGX 8950 Valid Slot Numbers
SRM-3T3/C	3 port Service Redundancy Module with T3 interfaces	BNC-3T3-M	Upper and lower	7 and 14[4]	15,16, 31, 32	—	—
SRME	1 port Service Redundancy Module with SONET or SDH interfaces	MGX-SMFIR-1-155 MGX-STM1-EL-1	Upper and lower	7 and 14[4]	15,16, 31, 32	—	—
SRME/B	1 or 3 port Service Redundancy Module with T3, SONET, or SDH interfaces	MGX-SMFIR-1-155 MGX-STM1-EL-1 BNC-3T3-M	Upper and lower	7 and 14	15,16, 31, 32	15,16, 31, 32	—
VISM-PR-8E1	8-port E1 Voice Internetworking Service Module	AX-SMB-8E1 AX-R-SMB-8E1 AX-RJ48-8E1 AX-R-RJ48-8E1 MGX-RJ48-8E1[3]	Upper and lower	3-6, 10-13	1-6, 9-14, 17-22, 25-30	1-6, 9-14, 17-22, 25-30[14]	—
VISM-PR-8T1	8-port T1 Voice Internetworking Service Module	AX-RJ48-8T1 AX-R-RJ48-8T1	Upper and lower	3-6, 10-13	1-6, 9-14, 17-22, 25-30	1-6, 9-14, 17-22, 25-30[14]	—
VXSM-4-155[7]	4-port OC-3 Voice Switch Service Module	VXSM-BC-4-155 VXSM-R-BC	Upper and lower[15]	—	1-6, 9-14[13]	1-6, 9-14	—
VXSM-48-T1E1[7]	48-port T1 and E1 Voice Switch Service Module	VXSM-BC-24-T1E1 VXSM-R-BC	Upper and lower	—	1-6, 9-14[13]	1-6, 9-14	—
VXSM -6-T3[7]	6-port T3 voice Switch Service Module	VXSM-BC-3-T3 VXSM-R-BC	Upper and lower	—	1-6, 9-14[13]	1-6, 9-14	—
XM60	Switch Module 60 60 Gbps switch fabric	none	none	—	—	—	9, 10, 25, 26

1. MGX 8830 support includes MGX 8830/B within this table, unless otherwise noted.
2. MGX 8850 support includes MGX 8850/B within this table, unless otherwise notes.
3. This card is for use in Australia.
4. Not supported on MGX 8830 (PXM45) aor MGX 8830/B (PXM45).
5. SRM-3T3 does not support bulk distribution to 8-port T1 cards in slots 9, 10, 25, and 26. If SRM-3T3 and SRME/B with a T3 interface coexist in the same bay, bulk distribution for 8-port T1 cards in these slots is not supported. If a SRME/B with a T3 interface is replaced with an SRM-3T3, bulk distribution for 8-port T1 cards in these slots is not supported.

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6. Not supported on MGX 8850 (PXM45) or MGX 8850/B (PXM45) chassis.
7. Double-height card.
8. Not supported on MGX 8830 (PXM1E) or MGX 8830/B (PXM1E) chassis.
9. MGX8950-EXTDR-CON is required for AXSM-16-155-XG and AXSM-8-622-XG cards in the Cisco MGX 8950 chassis.
10. Configure the card for T1 or E1 mode using the **cnfcdmode** command.
11. Used for 1:N redundancy with RED-16-T1E1 in MGX 8850/B and MGX 8830/B chassis.
12. Supported on MGX 8850/B and MGX 8830/B only.
13. Not supported on MGX 8850 (PXM1E) or MGX 8850/B (PXM1E) chassis.
14. Bulk distribution is required if RCONs are installed in the upper slots.
15. A VXSM back card is installed in the lower bay only when intracard APS is in use.

MPSM Slot Assignments and MPSM Licensing

Consult your Cisco Customer Engineering representative for information about characterizing the quantity and placement of MPSM cards suitable for your network. For more information about MPSM licensing, see the the *Release Notes for Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8950, and Cisco MGX 8830 Switches, Release 5.2.00.*

Cisco MGX 8850 and MGX 8850/B Switches

The Cisco MGX 8850 (PXM45) multiservice switch was introduced in October 2000, on MGX Release 2.0. It used a PXM45 controller card.

Another MGX 8850 model was introduced in June 2002, on MGX Release 3.0.00. This model uses the new PXM1E controller card. Thus, starting with Release 3.0.00, for clarity, the controller card was added to the MGX 8850 switch name. For example, *MGX 8850 (PXM45)* and *MGX 8850 (PXM1E)*. The MGX 8850 (PXM45) and MGX 8850 (PXM1E) switches look very similar.

Another model, the MGX 8850/B was introduced in January 2005. This model also has a PXM45 version and PXM1E version, depending on the controller card. Further, this switch supports 1:N redundancy with the support of a factory-installed redundancy connector card(s). Figure 1-4 is an illustration of an installed RCON in an MGX 8850/B.

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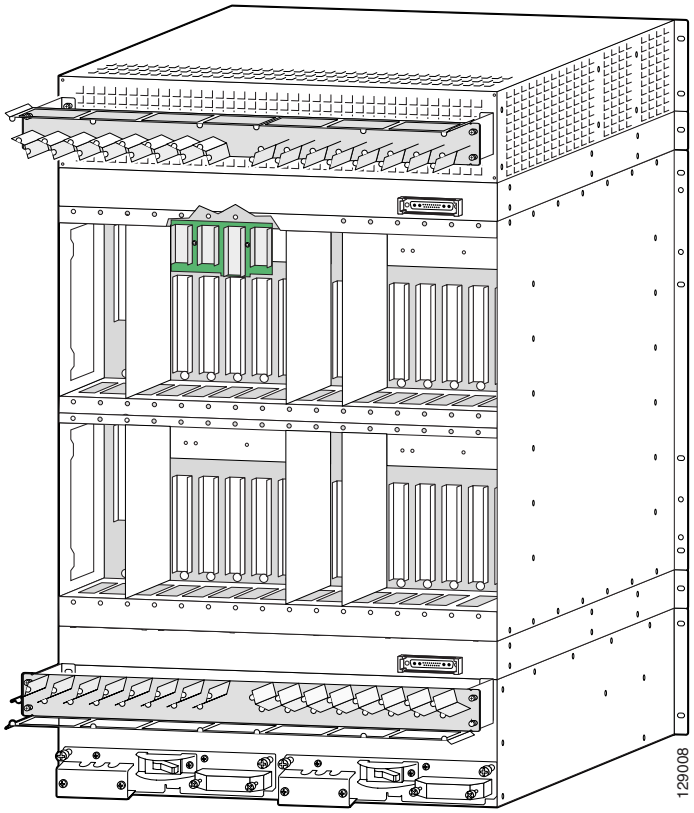
Figure 1-4 RCON Installed in MGX 8850/B Chassis (Chassis Rear View)



Note The information in this guide does not apply to the Cisco MGX 8850 (PXM1), which uses the PXM1 controller card and Release 1.x software. For documentation on Cisco MGX Release 1.x software and hardware, refer to http://www.cisco.com/univercd/cc/td/doc/product/wanbu/mgx8850/index.htm.

With the Cisco MGX 8850 switch, multiple control planes support flexibility and scalability in deploying, managing, and modifying a complete range of ATM, Multiprotocol Label Switching (MPLS), and voice services.

This section provides the following information:

- Features, page 1-17
- MGX 8850 (PXM1E) and MGX 8850/B (PXM1E) Switch Overview, page 1-17
- MGX 8850 (PXM45) and MGX 8850/B (PXM45) Switch Overview, page 1-18

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Features

Table 1-4 lists supported features for the Cisco MGX 8850 and MGX 8850/B switches.

Table 1-4 Cisco MGX 8850 (PXM1E/PXM45) Switch Features

Feature	MGX 8850 (PXM1E) MGX 8850/B (PXM1E)	MGX 8850 (PXM45) MGX 8850/B (PXM45)
Services:		
• ATM	Yes	Yes
• Circuit emulation	Yes	No
• Frame Relay	Yes	Yes
• IP	Yes	Yes
• Voice	Yes	Yes
Maximum throughput	1.2 Gbps	45 Gbps
Supports bulk distribution	Yes, module dependent	Yes, module dependent
Supports card set redundancy	Yes, module dependent	Yes, module dependent
Supports 1:N redundancy[1]	Yes, module dependent	Yes, module dependent
Supports APS line redundancy[2]	Yes, module dependent	Yes, module dependent

1. MGX 8850/B models only.
2. See Table 4-4 on page 4-19 for APS connector options and requirements.

The MGX 8850 or MGX 8850/B switch:

- Can use either an AC or a DC power source
- Is shipped in one of two configurations:
  - Cisco cabinet configuration—All components are shipped preinstalled in a Cisco cabinet.
  - Open rack configuration—Individual components are shipped ready for installation in a customer-supplied open rack or a third-party vendor cabinet.
- Fits in a 19-inch or a 23-inch rack

MGX 8850 (PXM1E) and MGX 8850/B (PXM1E) Switch Overview

The PXM1E is a PNNI-enabled, double-height switch controller card that provides switching capabilities for use at the ATM network edge.

Service modules support communications between non-ATM services (such as Frame Relay and IP) and the ATM services on an ATM network. All network communications or customer traffic in and out of the switch goes through the service modules and route processor modules (RPMs). When a service module or RPM is combined with one or two back cards, a *card set* is created.

The MGX 8850 (PXM1E) and MGX 8850/B (PXM1E) switches support the following module types:

- ATM User-to-Network Interface (UNI) service module (AUSM)—Single-height front card
- Circuit emulation service module (CESM)—single-height front card

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- Frame Relay service module (FRSM)—single-height front card
- Service resource module (SRM)—single-height front card
- Route processing module (RPM)—double-height front card
- Voice interworking service module (VISM)—single-height front card

MGX 8850 (PXM45) and MGX 8850/B (PXM45) Switch Overview

Note In this guide, PXM45, PXM45/B, and PXM45/C controller cards are identified collectively as PXM45, unless otherwise specified.

The PXM45 controller card allows implementation of a complete range of narrow band services for high-density edge applications and broadband aggregation with 45 Gbps of nonblocking switching. The PXM45 can also be used exclusively for broadband aggregation and backbone functions.

Service modules support communications between non-ATM services and the ATM services on an ATM network. All network communications or customer traffic in and out of the switch goes through the service modules and RPM cards. When a service module or RPM is combined with a one or two back cards, a card set is created.

The MGX 8850 (PXM45) and MGX 8850/B (PXM45) switches support the following module types:

- ATM service module (AXSM)—double-height front card
- Circuit emulation service module (CESM)—single-height front card
- Frame Relay service module (FRSM)—single- or double-height front card
- Route processing module (RPM)—double-height front card
- Service resource module (SRM)—single-height front card
- VISM—Single-height front card

Note The only VISM card supported in the Cisco MGX 8850 (PXM45) is the VISM-PR.

- VXSM—double-height front card

PXM45 Controller Card RAM and Software Release History

Updates to the PXM45 controller card included the PXM45/B and PXM45/C cards. The PXM45 RAM and software release history is as follows:

- PXM45, introduced October 2000, with MGX Release 2 software and 128 MB RAM
- PXM45/B, introduced October 2001, with MGX Release 2.1 software and 256 MB RAM
- PXM45/C, introduced April 2003, with MGX Release 4.0 software and 512 MB RAM

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MGX 8850 and MGX 8850/B Card Compartment

The MGX 8850 and MGX 8850/B switches each have 32 single-height slots in a compartment card cage that holds cards and modules. Some single-height slots can be converted to double-height slots by removing the service module slot dividers.

Table 1-3 lists the cards supported in a MGX 8850 and MGX 8850/B switches. Abbreviated card names are listed in the Glossary. (The initial *R-* on some back cards means that this is a *redundant* back card, which is used for 1:N card set redundancy without bulk distribution.)

Each slot on the front of the switch is numbered and has a corresponding slot located on the back of the switch. There are 32 front card slots and 32 back card slots. Slots 1 through 16 are in the top bay, and slots 17 through 32 are in the bottom bay of the switch.

Slot assignments and module support varies with the type of processor switching module you install in your switch (PXM1E or PXM45). The processor switching module allows service providers to deploy a complete set of services with up to 45 Gbps of nonblocking switching for low-density or remote deployments.

The following sections describe the supported cards and slot assignments for each type of processor switching module:

- MGX 8850 (PXM1E) and MGX 8850/B (PXM1E) Slot Assignments, page 1-20
- MGX 8850 (PXM45) and MGX 8850/B (PXM45) Slot Assignments, page 1-22

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MGX 8850 (PXM1E) and MGX 8850/B (PXM1E) Slot Assignments

Table 1-3 gives module slot assignments for the MGX 8850 (PXM1E) or MGX 8850/B (PXM1E) switch. Figure 1-5 shows module slot assignments (front view).

Figure 1-5 Cisco MGX 8850 (PXM1E) or MGX 8850/B (PXM1E) Slot Assignments—Front View

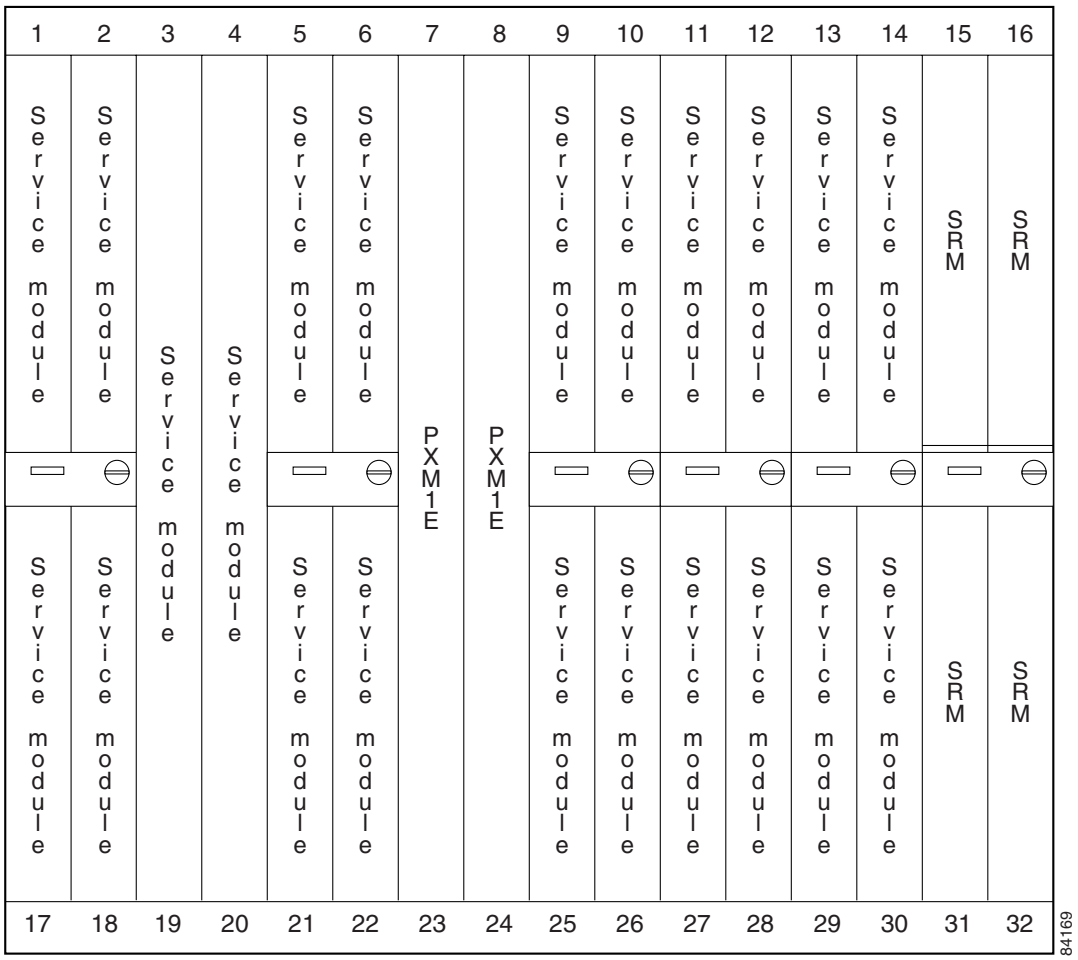

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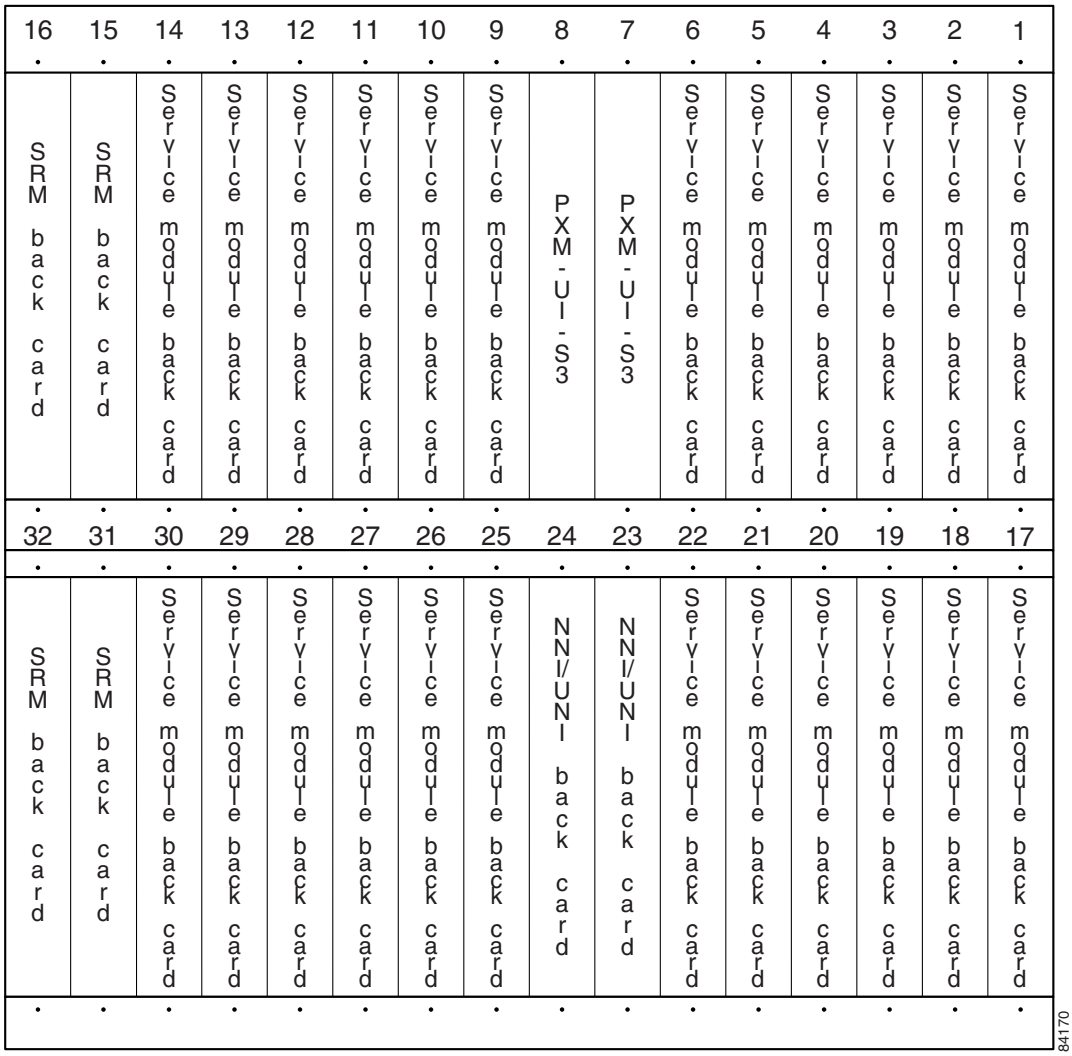
Figure 1-6 shows each module slot assignment (rear view) of the MGX 8850 (PXM1E) or MGX 8850/B (PXM1E) switch.

Figure 1-6 MGX 8850 (PXM1E) or MGX 8850/B (PXM1E) Switch Slot Assignment—Rear View



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MGX 8850 (PXM45) and MGX 8850/B (PXM45) Slot Assignments

Table 1-3 lists the module slot assignments for the MGX 8850 (PXM45) or MGX 8850/B (PXM45) switch. Figure 1-7 shows module slot assignments (front view) for the Cisco MGX 8850 (PXM45) switch or MGX 8850/B (PXM45) switch.

Figure 1-7 Cisco MGX 8850 (PXM45) Switch Slot Assignments—Front View

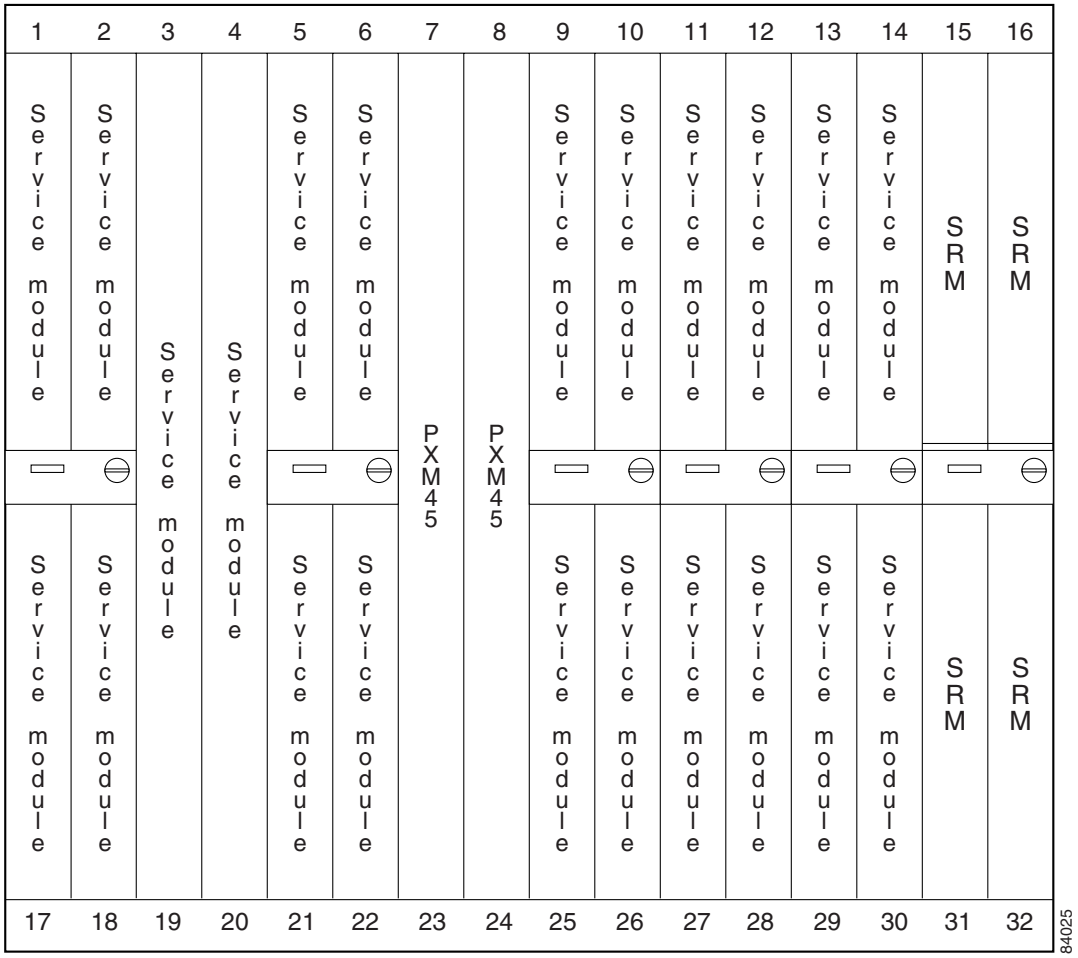

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Figure 1-8 shows module slot assignments (rear view) for the Cisco MGX 8850 (PXM45) or MGX 8850/B (PXM45) switch.

Figure 1-8 Cisco MGX 8850 (PXM45) Switch Slot Assignments—Rear View

MGX 8850 and MGX 8850/B System Hardware Components

Each Cisco MGX 8850 or MGX 8850/B switch supports the following hardware components:

- AC power supply tray (optional)—with power supply modules
- Air intake plenum
- APS connector—for line redundancy (optional)
- DC power entry module (PEM)
- Exhaust plenum
- Lower and upper fan trays
- 1:N Redundancy Connector (RCON)—MGX 8850/B only (optional)

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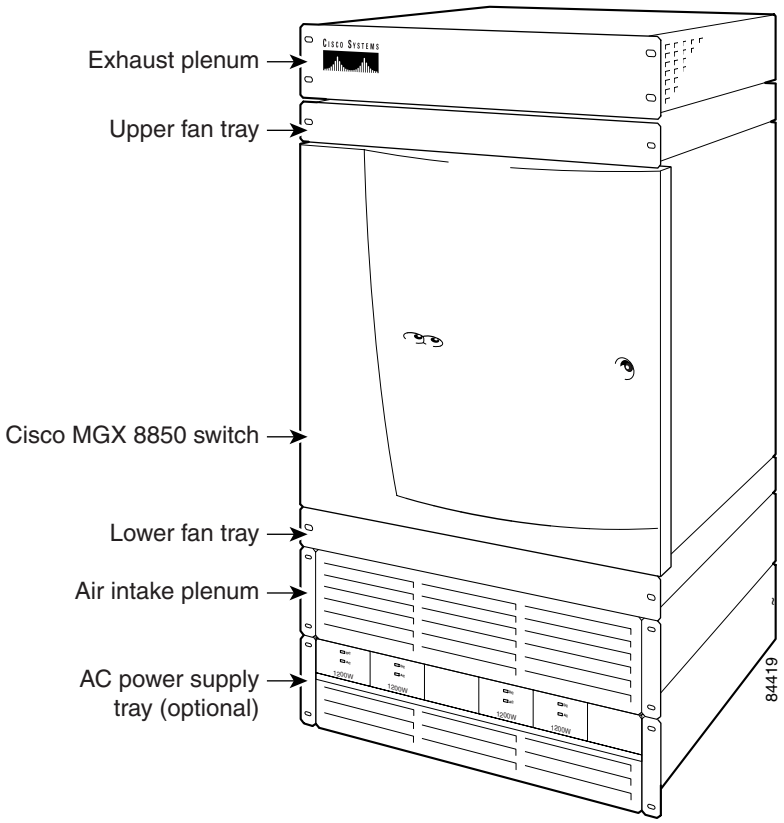
Figure 1-9 shows the hardware components that can be used with a Cisco MGX 8850 switch (viewed from the front of the switch). This illustration also shows the optional AC power supply tray installed at the bottom of the system. The switch can have an optional front door installed (as shown in Figure 1-9).

For the switch to be EMI compliant, either the optional front door must be installed on the switch or blank faceplates must be installed to cover any empty slots.

Note The DC PEM is installed on the rear of the chassis. The APS assembly is not visible in the illustration because it is installed inside the card cage.

Figure 1-9 Hardware Component Locations for a MGX 8850 or MGX 8850/B Switch—Front View



This section provides details about the following MGX 8850 or MGX 8850/B switch hardware components:

- AC Power Supply Tray, page 1-25
- Air Intake Plenum, page 1-27
- APS Assembly, page 1-28
- DC Power Entry Module, page 1-30
- Exhaust Plenum, page 1-32
- Lower and Upper Fan Trays, page 1-32
- MGX 8850/B Redundancy Connectors, page 1-33

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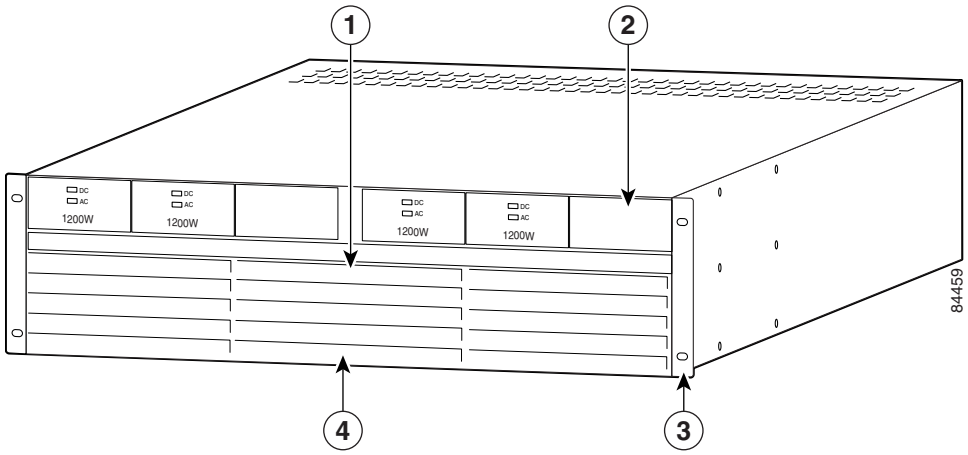
AC Power Supply Tray

The Cisco MGX 8850 switch can accept power from a 220 VAC (180 to 254 VAC) source that connects to an optional AC power supply tray, shown in Figure 1-10. The optional AC power supply tray houses up to six AC power supplies and is installed directly below the air intake plenum. The AC power supplies convert 220 VAC to –48 VDC power for the switch.

Figure 1-10 Optional AC Power Supply Tray



1	Release	**3**	Front flange
2	Blank panel	**4**	Air intake grille

Note Figure 1-10 shows only four AC power supplies installed in the AC power supply tray.

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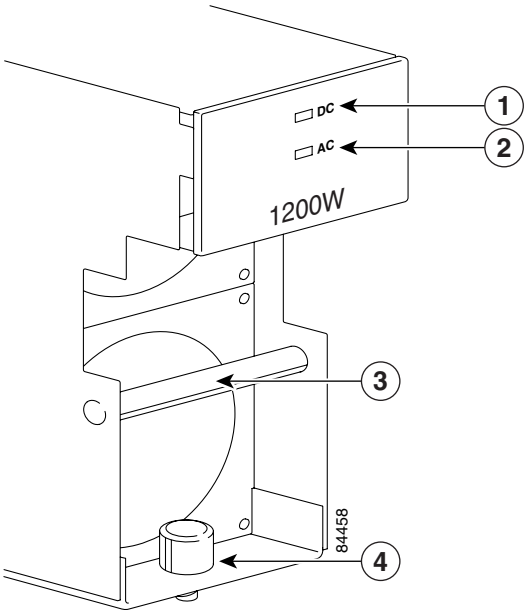
Figure 1-11 shows a close-up of the AC power supply faceplate.

Figure 1-11 AC Power Supply Faceplate



1	DC okay LED—Green	**3**	Handle
2	AC okay LED—Green	**4**	Captive screw

The AC power supply requirements for the switch depend on the following criteria:

- The number of service modules installed in the switch
- Whether the switch is a single AC power cord system or a dual AC power cord system

Use the guidelines in Table 1-5 for the AC power supply requirements.

Table 1-5 AC Power Supply Requirements for the MGX 8850 and MGX 8850/B Switch

Number of Service Modules Installed		
Double-Height	**Single-Height**	**Number of Power Supplies Required per Switch**
1 to 5	1 to 10	2 AC power supplies (minimum) for a dual or a single AC power cord system
6 to 10	11 to 20	4 AC power supplies (minimum) for a dual AC power cord system (2 on each power cord) 3 AC power supplies (minimum) for a single AC power cord system
11 or more	21 or more	6 AC power supplies for a dual AC power cord system 4 AC power supplies for a single power cord system

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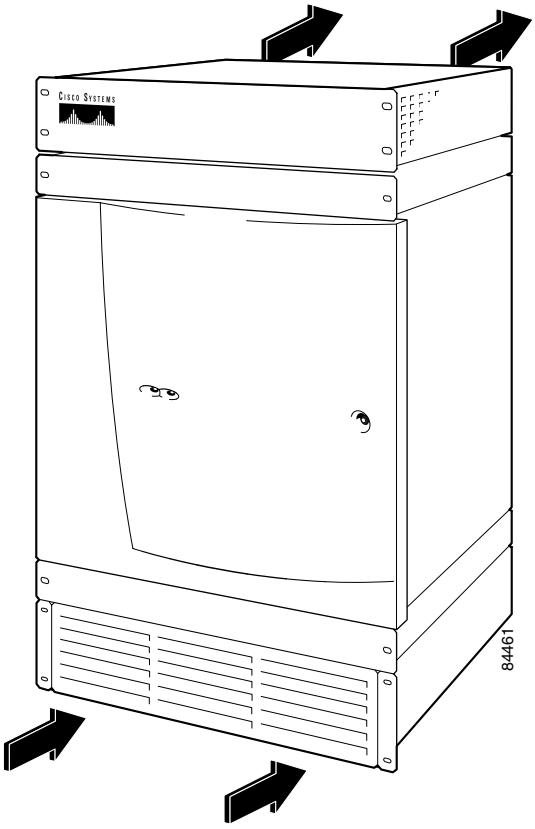
Note For AC power cord requirements, see the "Required Tools and Equipment" section on page 3-25.

Air Intake Plenum

The air intake plenum is installed below the lower fan tray (see Figure 1-9 for location). The fan trays pull air up through the modules to cool the modules. Then the air is forced up and out of the exhaust plenum, as shown in Figure 1-12.

Figure 1-12 Air Flow through the MGX 8850 or MGX 8850/B System



There are two versions of the air intake plenum in the field:

- MGX-PLENUM=—Support from Release 2 to Release 3.0.10
- MGX-PLENUM-FLTR=—Support from Release 4 and forward has the capability to hold an air filter. Air filters can be purchased through a third party.

Note For information about replacing the air filter, see "Replacing the Air Intake Plenum Filter" section on page 6-13.

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APS Assembly

For both equipment and fiber protection, 1+1 card and APS line redundancy require an APS connector that links the two optical back cards: an active card and a standby card. Figure 1-13 shows the MGX-8850-APS-CON connector.

Figure 1-13 MGX-8850-APS-CON

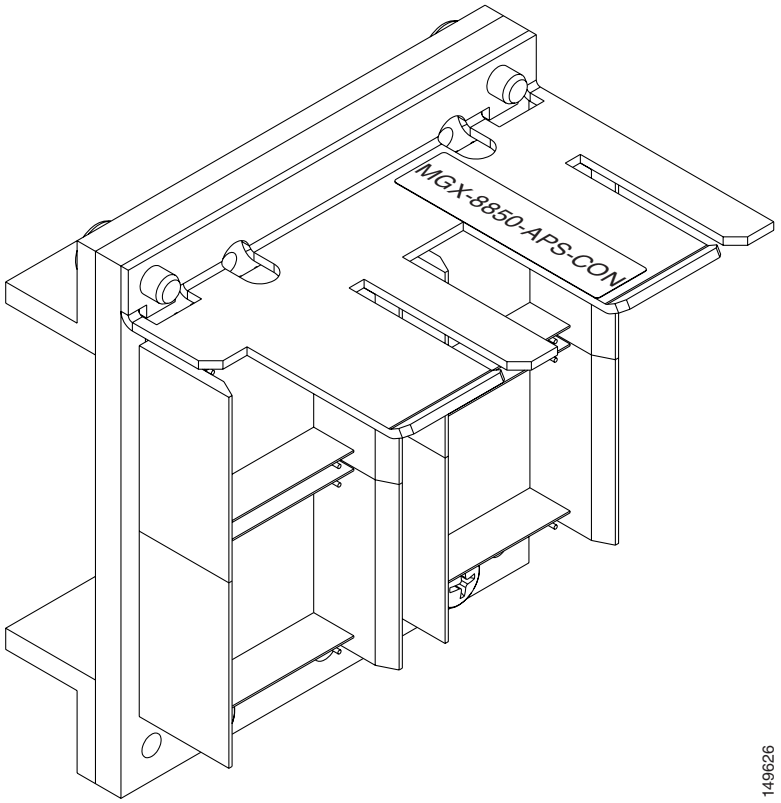

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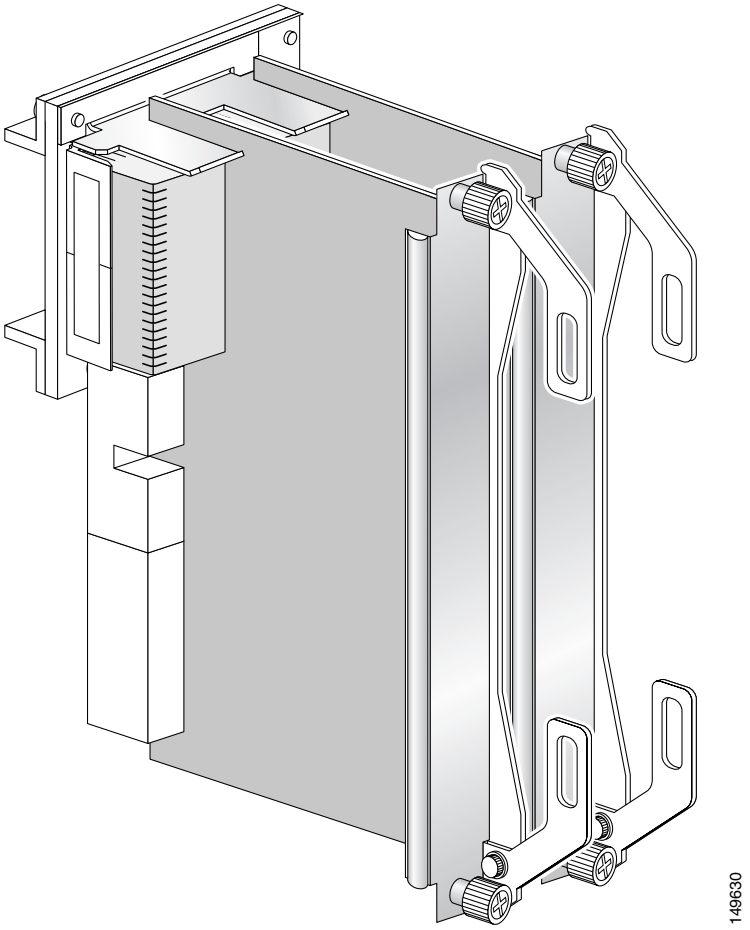
Figure 1-14 shows an example of two back cards installed in the 8850 APS connector. When the two back cards are inserted into an APS connector, they form an APS assembly. The APS assembly is installed in the rear of the switch.

Figure 1-14 APS Assembly Example for MGX 8850 (MGX-8850-APS-CON)



Two APS connectors are available for the MGX 8850 or MGX 8850/B switch (Cisco Part Number MGX-8850-APS-CON or MGX-APS-CON). Table 1-6 lists the modules that the APS connectors support. For more information about APS options and requirements, see Table 4-4.

Table 1-6 APS Connector Support for MGX 8850 or MGX 8850/B Switch Modules

Module	MGX-8850-APS-CON (MGX 8850 and MGX 8850/B)	MGX-APS-CON (MGX 8850 only)
AXSM-1-2488[1]	Yes	Yes
AXSM-1-2488/B	Yes	Yes
AXSM-2-622-E	Yes	Yes
AXSM-4-622	Yes	Yes
AXSM-4-622/B	Yes	Yes
AXSM-8-155-E	Yes	Yes

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Table 1-6 APS Connector Support for MGX 8850 or MGX 8850/B Switch Modules

Module	MGX-8850-APS-CON (MGX 8850 and MGX 8850/B)	MGX-APS-CON (MGX 8850 only)
AXSM-16-155	Yes	Yes
AXSM-16-155/B	Yes	Yes
AXSM-8-622-XG	Yes	Yes
MPSM-T3E3-155	Yes	No
PXM1E-4-155	Recommended	Recommended
PXM1E-8-155	Yes	Yes
SRME	Yes	No

1. Not supported with MGX 8850/B (PXM1E) switch

Caution Although the PXM1E-4-155 does not need an APS connector to support APS line redundancy, it is recommended that you install the PXM1E-4-155 in an APS connector to support a seamless upgrade to the PXM1E-8-155 card.

For information on APS software configuration, refer to the software configuration guide that matches your MGX switch name and release. The "Obtaining Documentation" section explains how to find these documents online.

DC Power Entry Module

The MGX 8850 or MGX 8850/B switch can accept power from a –48 VDC (–42 to –56 VDC) source that connects to one (primary) or two (secondary/redundant) –48 VDC PEMs. Each DC PEM must be connected to a dedicated 60 A regulated source. Figure 1-15 shows a close-up of the DC PEM faceplate.

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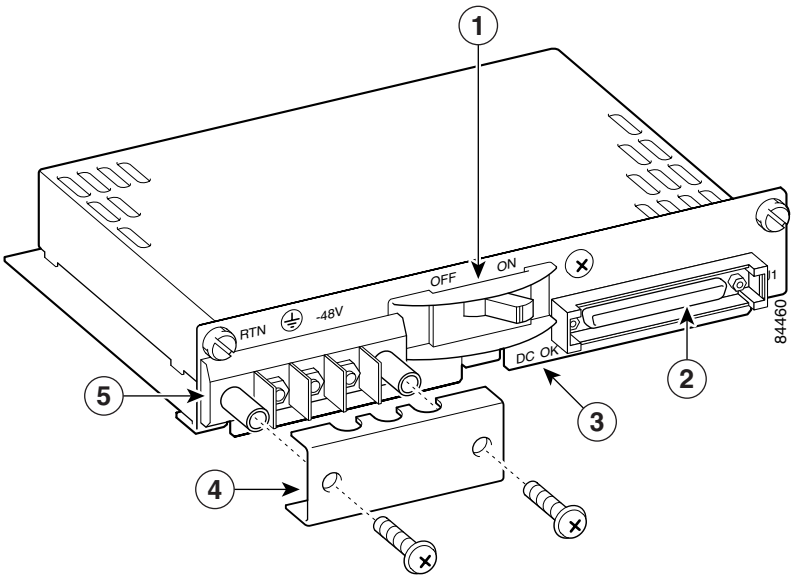
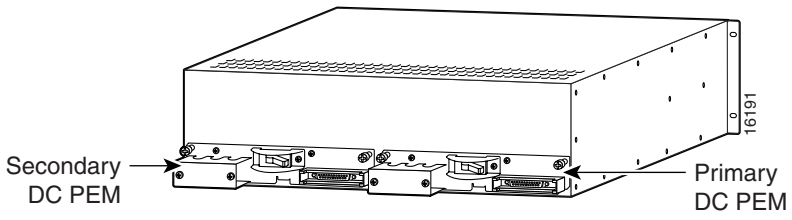
Figure 1-15 DC PEM Faceplate



1	Two-position circuit breaker. The positions are Off and On.	**4**	Plastic cover.
2	J1 output connector.	**5**	Terminal block 1 (DC input).
3	Green LED showing status of the DC PEM.		

For a DC-powered system, the DC PEMs are installed at the back of the air intake plenum. If you install only one DC PEM, install it on the right, as viewed from the rear of the air intake plenum. (See Figure 1-16.)

Figure 1-16 DC PEMs Installed in Back of the Air Intake Module



For more information about DC power requirements, see the "Power Requirements" section on page 3-17.

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Exhaust Plenum

The exhaust plenum is installed above the upper fan tray (see Figure 1-9 for location). The fan trays pull air from the air intake plenum up through the modules to cool the modules. Then the air is forced up and out of the exhaust plenum, as shown in Figure 1-12.

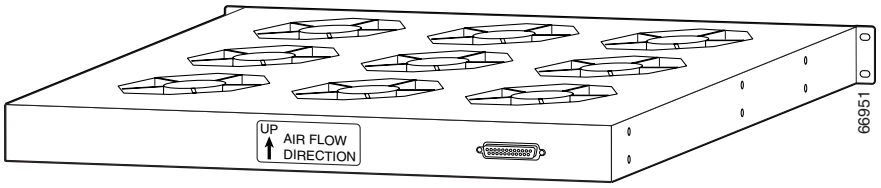
Lower and Upper Fan Trays

Each fan tray houses nine fans that provide system cooling. The MGX 8850 or MGX 8850/B switch requires that two fan trays (upper and lower) be installed when the system is in operation.

Figure 1-9 shows the location of the lower and upper fan trays in a system. Figure 1-17 shows the rear view of the fan tray.

Caution When a fan tray is installed, the arrow on the air flow direction label on the back of the fan tray should point up.

Figure 1-17 Fan Tray—Rear View



When the switch is shipped pre-installed in a Cisco-supplied cabinet, the fan trays are installed in the cabinet as well.

Caution If a fan tray fails, replace it immediately.

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MGX 8850/B Redundancy Connectors

The MGX 8850/B chassis has optional 1:3 (RCON-1to3-8850) and 1:5 (RCON-1TO5-8850) RCONs for 1:N redundancy when using MPSM-16-T1E1 cards. A single chassis supports up to four RCONs, on the left and right sides of the upper and lower bays. These RCONs are keyed to ensure that back cards are inserted properly.

Figure 1-4 shows an RCON installed in an MGX 8850/B chassis. Figure 1-18 and Figure 1-19 show the 1:5 and 1:3 assemblies, respectively.

Figure 1-18 RCON-1TO5-8850 RCON Connector

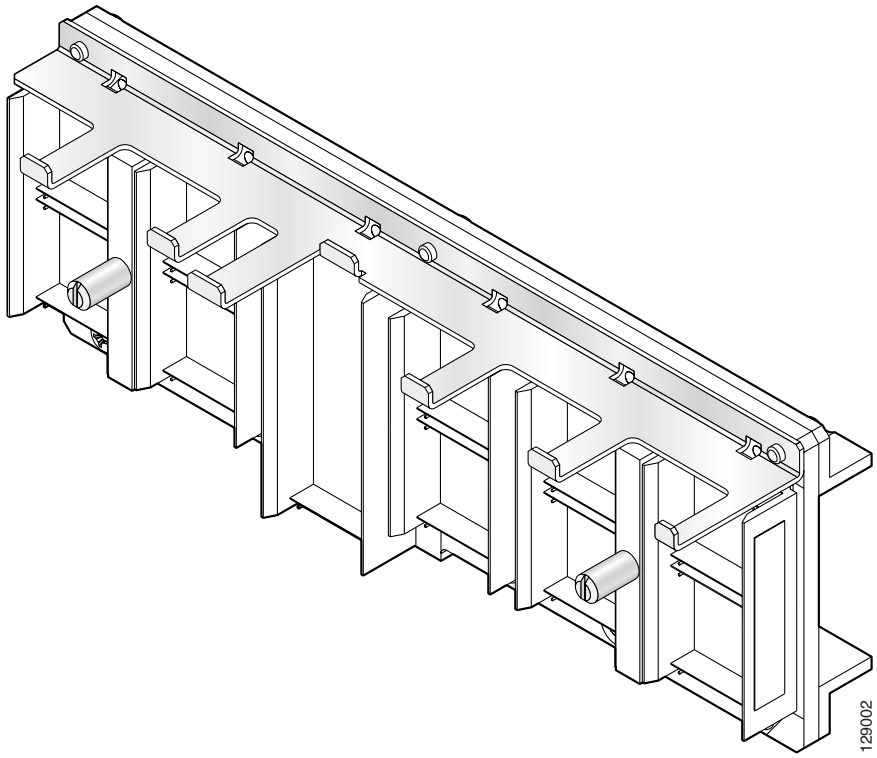

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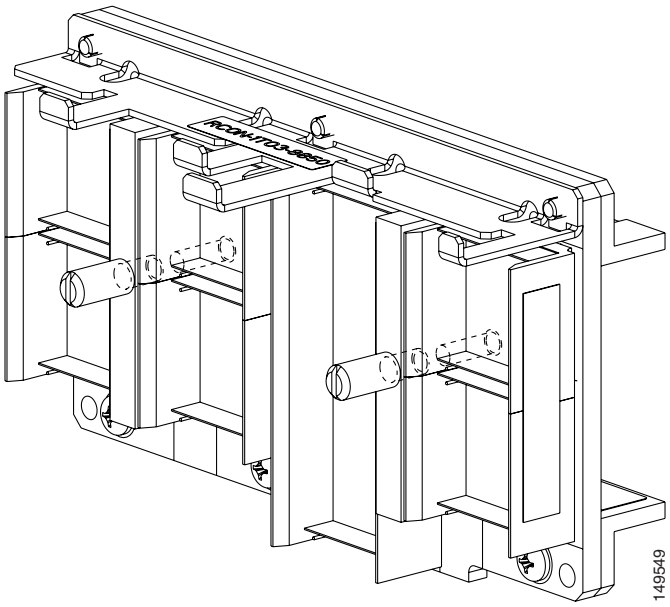
Figure 1-19 RCON-1TO3-8850 RCON Connector



To install or remove RCONs, see Installing or Removing Redundancy Connectors, page 6-22.

Cisco MGX 8950 Switch

The MGX 8950 multiservice core switch was introduced in May 2002 on MGX Release 2.1.76.

MGX 8950 Switch Overview

The MGX 8950 multiservice switch is a high-capacity ATM backbone switch that provides the following features:

- Scalability up to 180-Gbps fully redundant nonblocking throughput within a single chassis
- Industry-leading broadband density
- Aggregation of OC-3C/STM-1, OC-12Cc/STM-4, and OC-48c/STM-16 trunks
- Highest network availability in the industry
- Single-platform support for permanent virtual circuits/paths (PVCs/PVPs), soft permanent virtual circuits/paths (SPVCs/SPVPs), switched virtual circuits/paths (SVCs/SVPs), label virtual circuits (LVCs), PNNI, and MPLS

The MGX 8950 supports the following services:

- High-density broadband ATM
- Scaling MPLS services
- Convergence of voice and data networks

The MGX 8950 switch:

- Provides up to 240 Gbps of switching capacity through the backplane, using four dedicated switch fabric modules (XM60s), each containing 60 Gbps of cross-bar switching fabric
- Can use either an AC or a DC power source

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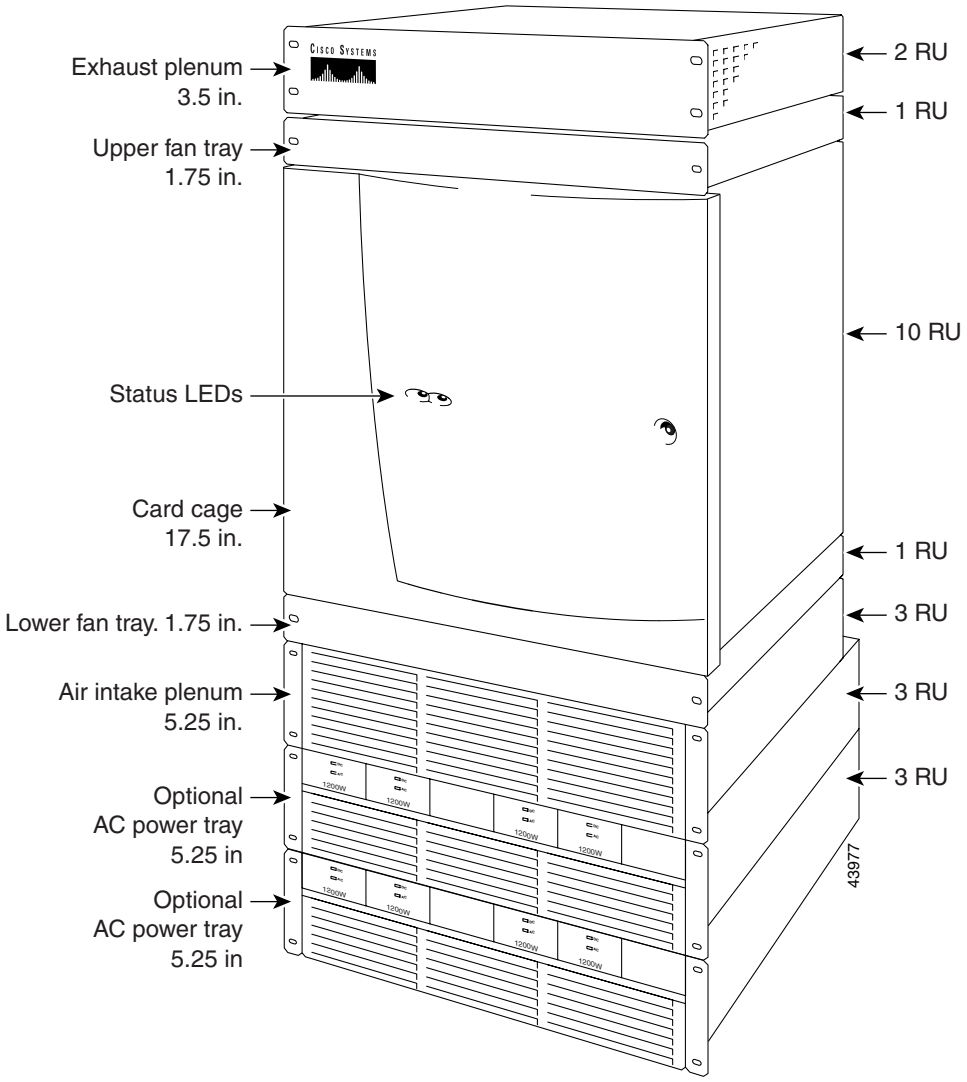
- Is shipped in one of two configurations:
  - Cisco cabinet configuration—All components are shipped preinstalled in a Cisco cabinet.
  - Open rack configuration—Individual components are shipped ready for installation in a customer-supplied open rack or a third-party vendor cabinet.
- Fits in a 19-inch or a 23-inch rack
- Supports the following modules:
  - ATM switching service module (AXSM)
  - Processor switching module (PXM45/B or PXM45/C)
  - Route processor module–premium (RPM-PR)
  - Route processor module–express forwarding (RPM-XF)
  - XM60

Figure 1-20 shows the MGX 8950 switch and corresponding hardware components.

Figure 1-20 Hardware Component Locations for a Cisco MGX 8950 Switch—AC-Powered Version



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MGX 8950 Card Compartment

The MGX 8950 switch has 32 single-height slots in a compartment card cage that holds cards and modules. Some single-height slots can be converted to double-height slots by removing the midrail dividers.

MGX 8950 Slot Assignments

Each slot on the front of the switch is numbered and has a corresponding slot located on the back of the switch. There are 32 front card slots and 32 back card slots. Slots 1 through 16 are in the top bay and slots 17 through 32 are in the bottom bay of the switch.

Table 1-3 lists module slot assignments for the MGX 8950 switch.

MGX 8950 Cards Supported

Table 1-3 lists cards supported in a MGX 8950 switch. The MGX 8950 switch was introduced in MGX Release 2.1.

MGX 8950 System Hardware Components

This section provides details about the following MGX 8950 switch hardware components;

- AC Power Supply Tray, page 1-37
- Extender Card, page 1-39
- Air Intake and Exhaust Plenums, page 1-40
- APS Assembly, page 1-41
- Cable Management Assembly, page 1-43
- DC Power Entry Module, page 1-44
- Lower and Upper Fan Trays, page 1-45

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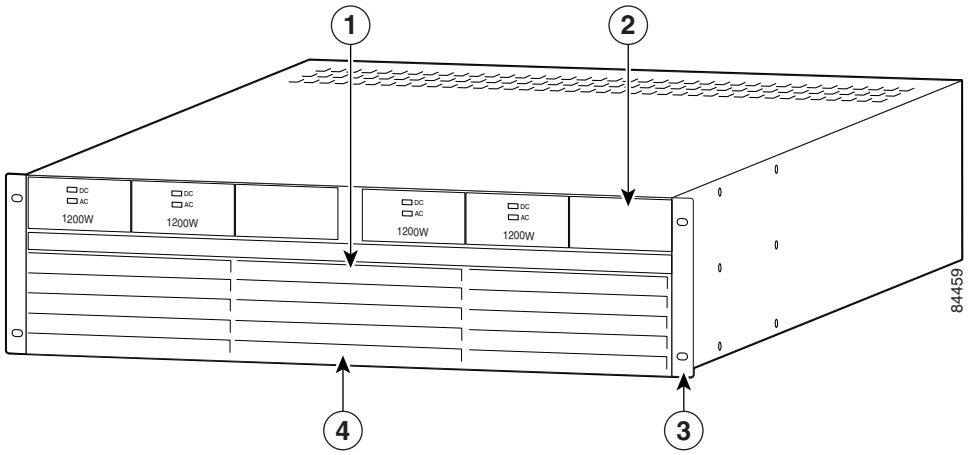
AC Power Supply Tray

The MGX 8950 can accept power from a 220 VAC (180–254 VAC) source that connects to an optional AC power supply tray, shown in Figure 1-21. The optional AC power supply tray houses up to four AC power supplies and is installed directly below the air intake plenum. The AC power supplies convert 220 VAC to –48 VDC power for the switch.

Figure 1-21 MGX 8950 Optional AC Power Supply Tray



1	Release	3	Front flange
2	Blank panel	4	Air intake grille

Note Figure 1-21 shows four AC power supplies installed in the AC power supply tray.

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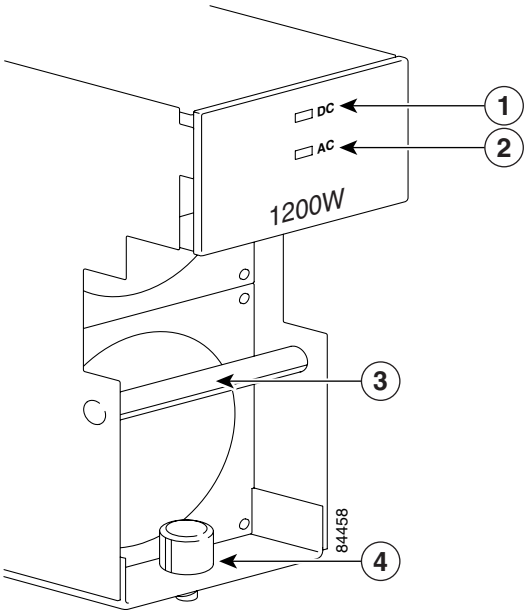
Figure 1-22 shows a close-up of the AC power supply faceplate.

Figure 1-22 AC Power Supply Faceplate



1	DC okay LED—Green	**3**	Handle
2	AC okay LED—Green	**4**	Captive screw

The AC power supply requirements for the switch depend on the number of service modules installed in the switch.

Use the guidelines in Table 1-7 for the AC power supply requirements.

Table 1-7 AC Power Supply Requirements for the MGX 8950 Switch

Number of Service Modules Installed		
Double-Height	**Single-Height**	**Number of Power Supplies Required per Switch**
1 to 5	1 to 10	4 AC power supplies (2 on each power tray (line cord)) for a dual, or 2 power supplies in a single AC power cord system.
6 to 10	11 to 20	6 AC power supplies (minimum) for a dual AC power cord system (3 on each power cord) 3 AC power supplies (minimum) for a single AC power cord system
11 or more	21 or more	8 AC power supplies (3 on each power cord) for a dual AC power cord system 4 AC power supplies for a single power cord system

Note For AC power cord requirements, see the "Required Tools and Equipment" section on page 3-25.

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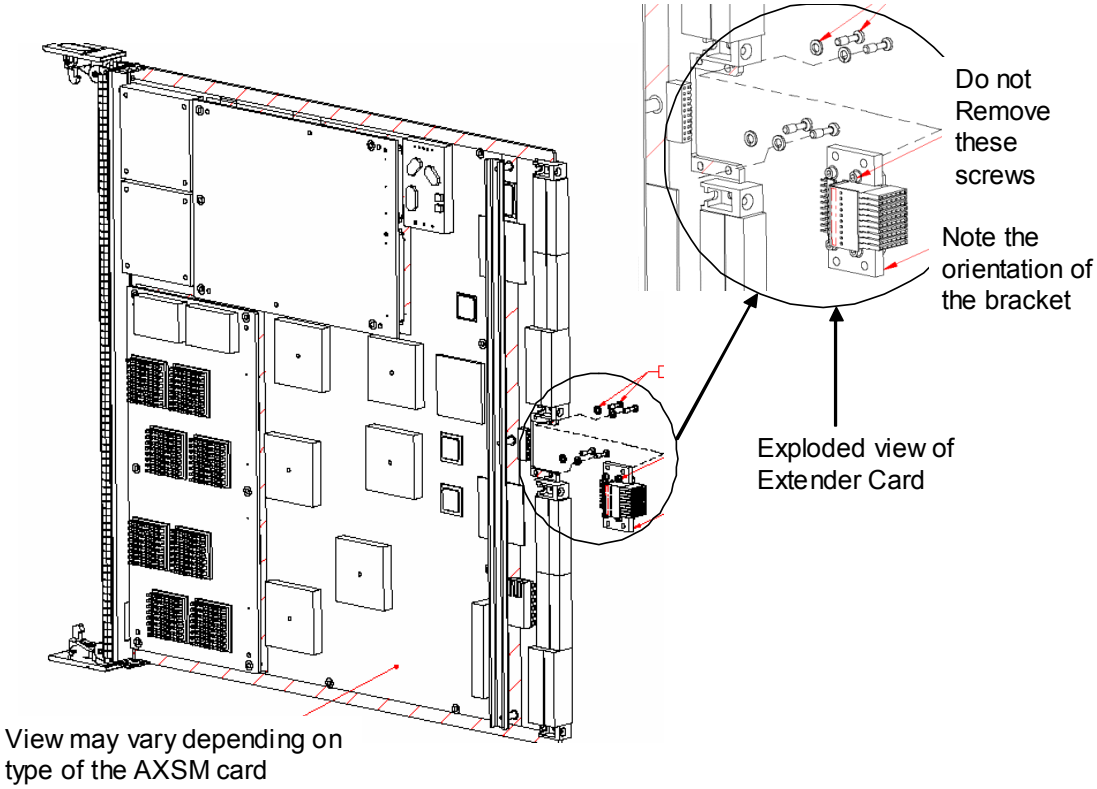
Extender Card

The extender card was introduced in Release 5. It supports AXSM-XG cards only. The AXSM-XG card has a cutout on the rear edge to accommodate mounting the extender card. This card is required because the MGX 8950 uses VHDM connectors. See Figure 1-23 for details on the extender card.

Figure 1-23 Extender Card, Used in MGX 8950 for AXSM-XG Cards


Do not Remove these screws
Note the orientation of the bracket
Exploded view of Extender Card
View may vary depending on type of the AXSM card

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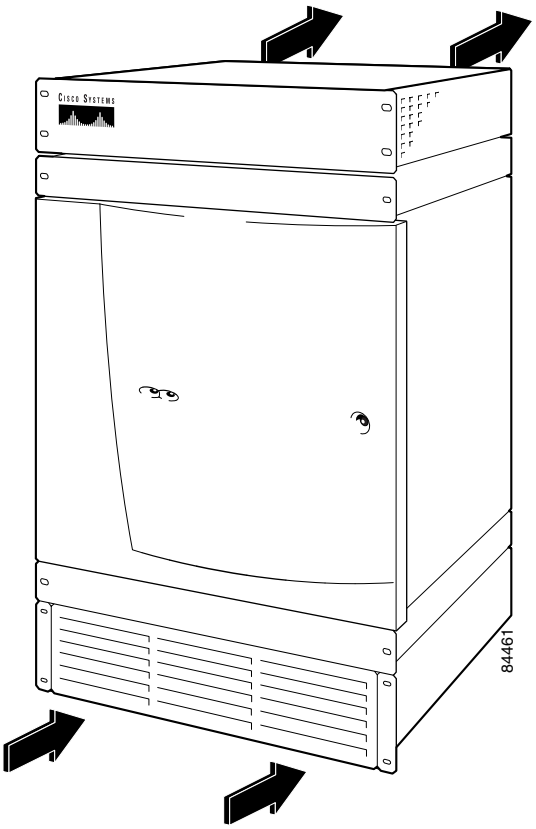
Air Intake and Exhaust Plenums

The air intake plenum is installed below the lower fan tray (see Figure 1-20 for location). The fan trays pull air up through the modules to cool the modules. Then the air is forced up and out of the exhaust plenum, as shown in Figure 1-24.

Figure 1-24 Air Flow Through the MGX 8950 Switch



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APS Assembly

For both equipment and fiber protection, 1+1 card and APS line redundancy require an APS connector (Cisco part number MGX-APS-CON-8950) that links the two optical back cards: an active card and a standby card. Figure 1-26 shows the MGX-APS-CON-8950 APS connector.

Figure 1-25 MGX-APS-CON-8950

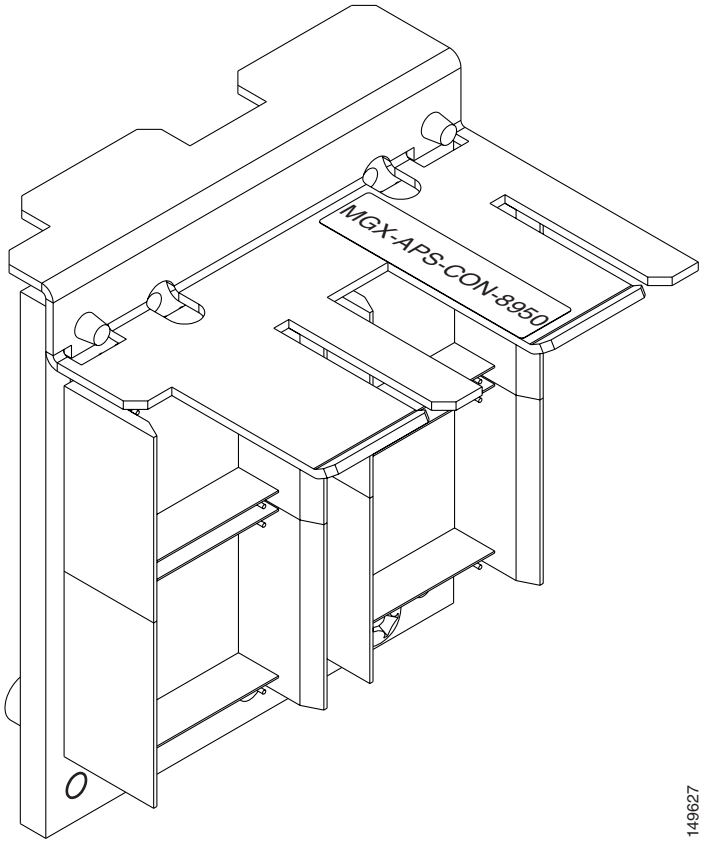

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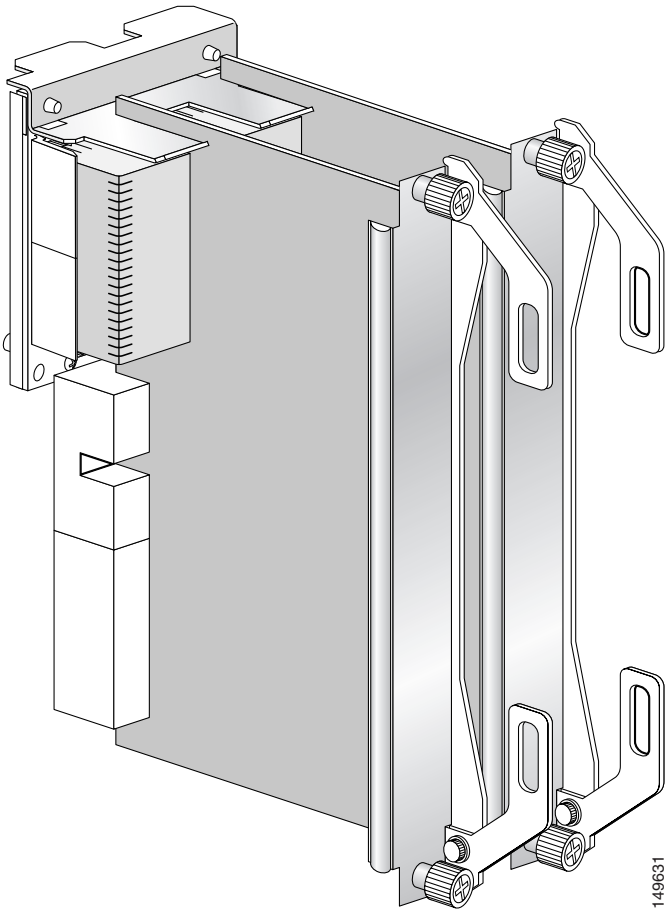
Figure 1-26 shows an example of two back cards installed in an APS connector. When the two back cards are linked to an APS connector, they form an APS assembly. The APS assembly is installed in the rear of the switch. For more information, see the Table 4-4.

Figure 1-26 APS Assembly Example for MGX 8950 (MGX-APS-CON-8950)



The following modules support the MGX 8950 APS connector (MGX-APS-CON-8950). For more information about APS options and requirements, see Table 4-4.

- AXSM-1-2488/B
- AXSM-4-622/B
- AXSM-16-155/B
- AXSM-1-9953-XG
- AXSM-4-2488-XG
- AXSM-8-622-XG
- AXSM-16-155-XG

For information on APS configuration, refer to the appropriate Cisco MGX release notes, or the Cisco MGX software configuration guide for your software release.

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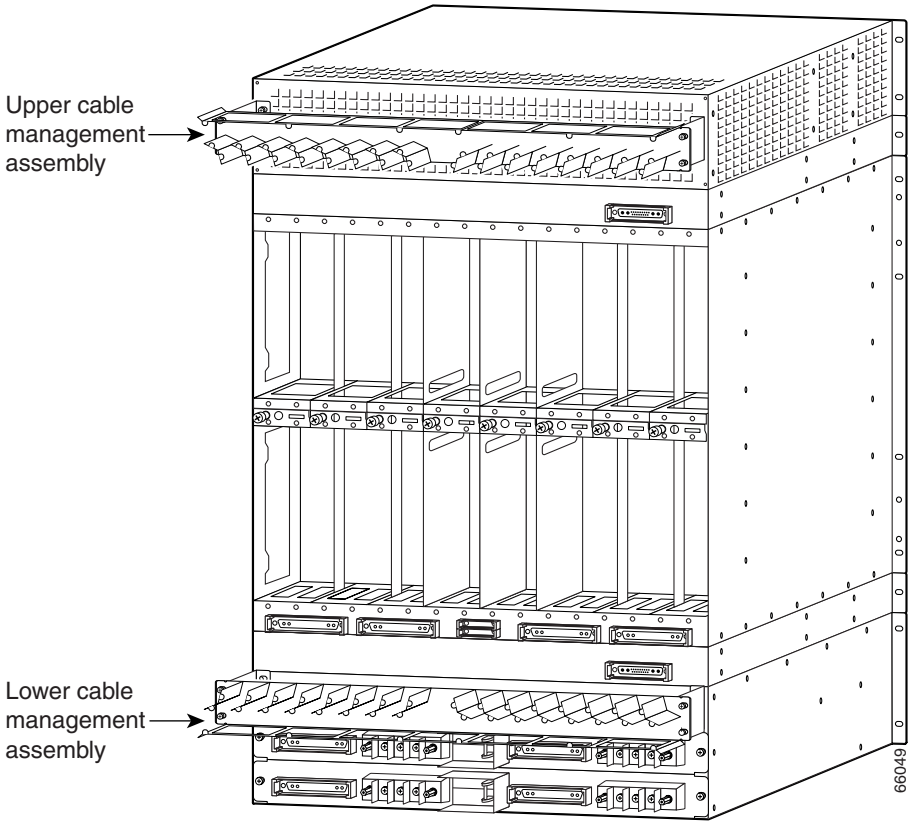
Cable Management Assembly

The cable management system consists of two identical, horizontal cable management assemblies (an upper and a lower assembly), left-side and right-side mounting brackets, and screws.

Figure 1-27 shows the upper and lower cable management assemblies installed on the back of the MGX 8950 switch.

Figure 1-27 Cable Management Assemblies



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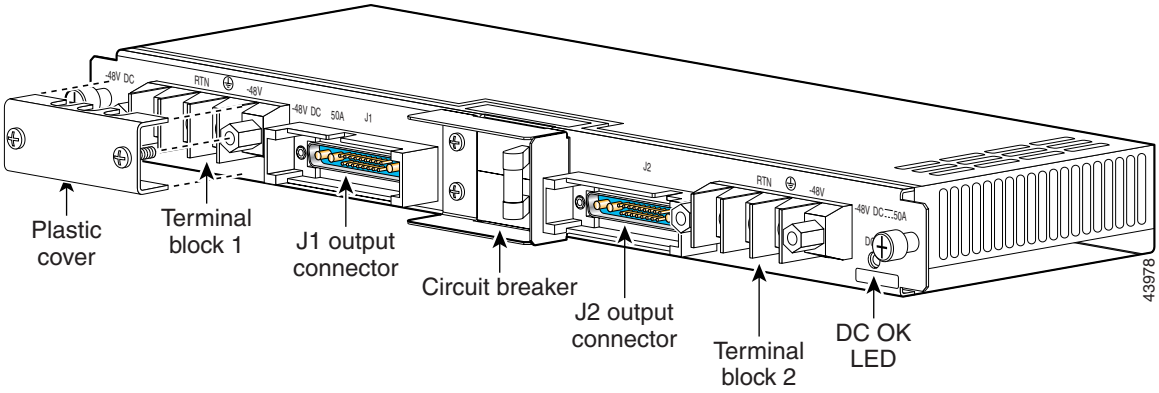
DC Power Entry Module

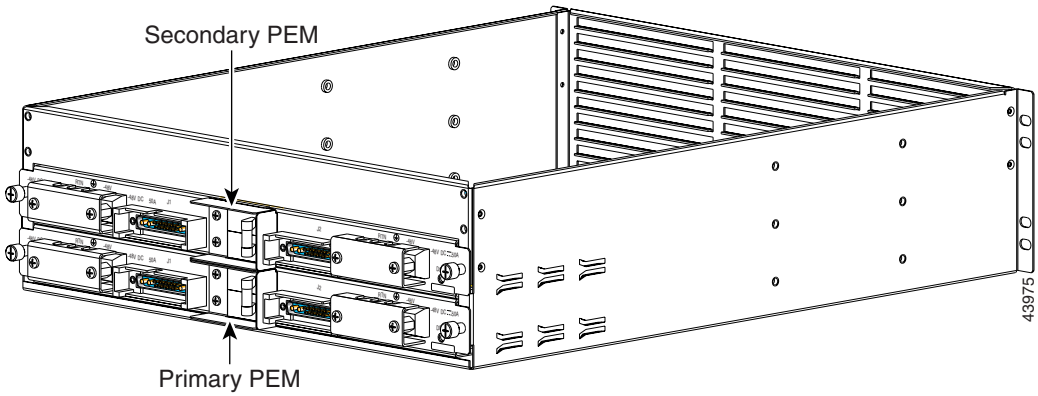
The MGX 8950 can accept power from a –48 VDC (–42 + –56 VDC) DC source that connects to one (primary) or two (secondary/redundant) –48 VDC PEMs. Each primary or redundant DC source connects to one DC PEM in the system. Each DC PEM accepts two 100 A service feeds from the same DC source. Figure 1-28 shows a close-up of the DC PEM.

Figure 1-28 MGX 8950 DC PEM



For a DC-powered system, the DC PEMs are installed at the back of the air intake plenum. If you install only one DC PEM, install it on the bottom, as viewed from the rear of the air intake plenum. (See Figure 1-29.)

Figure 1-29 Primary and Secondary DC PEMs



For more information about DC power requirements, see the "Power Requirements" section on page 3-17.

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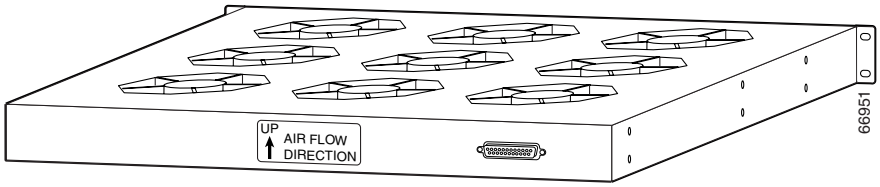
Lower and Upper Fan Trays

Each fan tray houses nine fans that provide system cooling. The MGX 8950 switch requires that two fan trays (upper and lower) be installed when the system is in operation. Figure 1-20 shows the location of the lower and upper fan trays in a system.

Figure 1-30 shows the rear view of the fan tray.

Caution When a fan tray is installed, the arrow on the air flow direction label on the back of the fan tray should point up.

Figure 1-30 Fan Tray—Rear View



When the MGX 8950 switch is shipped pre-installed in a Cisco-supplied cabinet, the fan trays are installed in the cabinet as well.

Caution If a fan tray fails, replace it immediately.

Cisco MGX 8830 or MGX 8830/B Switch

The MGX 8830 or MGX 8830/B multiservice switch is a small footprint multiservice gateway specifically designed for service providers with space and power constraints. The switch offers cost-effective narrow band, voice, and IP services. The MGX 8830 or MGX 8830/B switch supports the following services:

- IP Virtual Private Networks (VPNs) using Cisco IOS software-based MPLS
- Full suite of Voice over IP, Voice over ATM, and full interworking capabilities
- Frame Relay services
- High-density PPP for Internet access and aggregation
- Narrow band ATM for managed data, voice, and video services
- Circuit emulation for private line replacement
- Bulk distribution, card set redundancy, and automatic protection switching (APS) line redundancy
- 1:N redundancy with MGX 8830/B model

The MGX 8830 or MGX 8830/B switch:

- Can use either an AC or a DC power source
- Is shipped in one of two configurations:
  - Cisco cabinet configuration—All components are shipped preinstalled in a Cisco cabinet.

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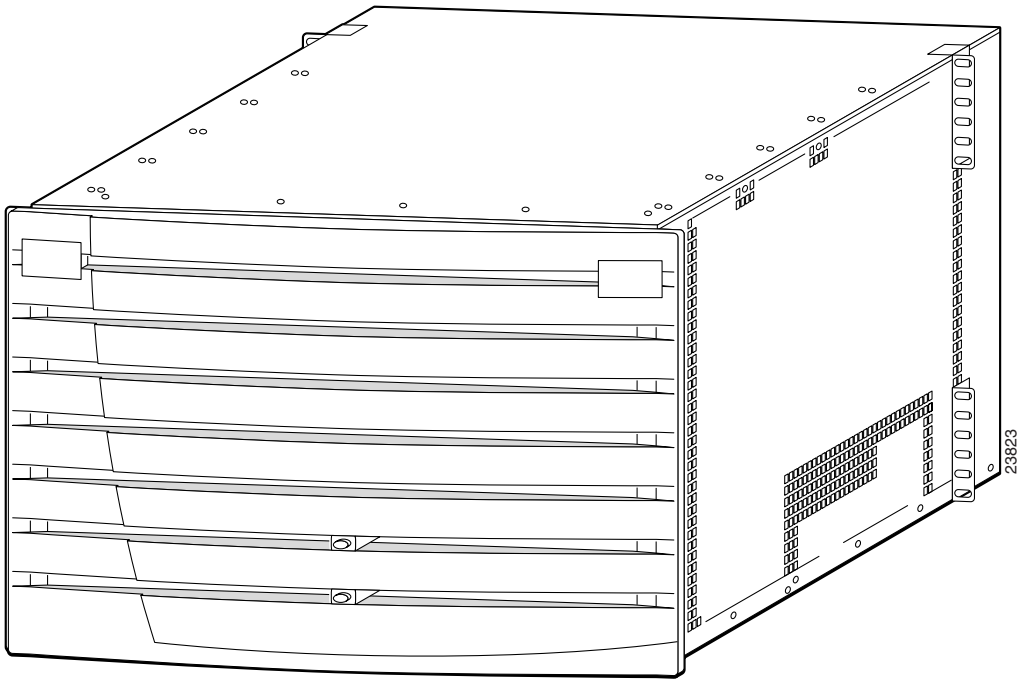
  - Open rack configuration—Individual components are shipped ready for installation in a customer-supplied open rack or a third-party vendor cabinet.
- Fits in a 19-inch or a 23-inch rack
- Supports the following modules:
  - ATM User-to-Network Interface (UNI) service module (AUSM)—Single-height front card
  - Circuit emulation service module (CESM)—Single-height front card
  - Frame Relay service module (FRSM)—Single-height front card
  - Processor switching module (PXM1E)—Double-height front card
  - Service resource module (SRM)—Single-height front card
  - Route processing module (RPM)—Double-height front card
  - Voice interworking service module (VISM)—Single-height front card

Note Although the card slots in a MGX 8830 switch are horizontal, this guide refers to the card slots and modules as single-height and double-height.

Figure 1-31 is an illustration of the MGX 8830 switch with its door attached. Light pipes in the door display the status of the PXM1E cards. The MGX 8830/B has a redesigned door with a slightly different appearance than the MGX 8830 door, but they are functionally equivalent.

For the MGX 8830 switch, the door is not required to meet electromagnetic interference (EMI) requirements. Either installed blank faceplates or installed cards help meet that requirement.

Figure 1-31 MGX 8830 Switch with Door Attached



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This section includes the following information:

- Applications, page 1-47
- Interface Support, page 1-47
- Standards-Based Conversion to ATM, page 1-48
- MGX 8830 Card Compartment, page 1-48
- MGX 8830 System Hardware Components, page 1-50

Applications

The MGX 8830 or MGX 8830/B switch operates:

- As a stand-alone switch—The MGX 8830 or MGX 8830/B switch can be deployed as a stand-alone switch, providing cross-connect connections between UNI and Network-to-Network Interface (NNI) ports. The switch acts as a concentrator, allowing standards-based adaptation and concentration of multiservice traffic onto one or more high-speed ATM interfaces. This enables the switch to interface to a multivendor ATM network, or to any other ATM-attached device. The Cisco MGX 8830 switch interfaces to the ATM equipment using a standard ATM UNI or NNI.
- As a consolidator of Cisco customer premises equipment (CPE) traffic—At the edge of the network, the MGX 8830 or MGX 8830/B switch can interwork with and consolidate traffic from a wide variety of CPE equipment.
- As a multiservice stand-alone concentrator—The MGX 8830 or MGX 8830/B switch can be deployed as a stand-alone concentrator, interfacing to a multivendor ATM (non-BPX) network. The Cisco MGX 8830 switch interfaces to ATM equipment using a standard ATM UNI or NNI.

Interface Support

The MGX 8830 or MGX 8830/B switch supports a wide range of services over narrow band and mid-band user interfaces. It uses standardized interworking methods to map all service traffic to and from ATM. The Cisco MGX 8830 switch supports up to 64 channelized or non-channelized T1 and E1 interfaces on a single IP + ATM multiservice gateway.

The MGX 8830 or MGX 8830/B supports the following user traffic interfaces:

- Frame Relay UNI on HSSI, T1, and E1 lines
- ATM UNI and Frame user network interface (FUNI)
- Optional inverse multiplexing over ATM (IMA)
- Frame Relay to ATM network interworking and service interworking
- Circuit emulation services for T1 and E1 lines

The modular, software-based system architecture enables the MGX 8830 or MGX 8830/B switch to support new features through downloadable software upgrades or new hardware modules.

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Standards-Based Conversion to ATM

The MGX 8830 or MGX 8830/B switch converts all user information into 53-byte ATM cells by using the appropriate ATM adaptation layer (AAL) for transport over the ATM backbone network. The individual service modules segmentation and reassembly (SAR) cells to eliminate system bottlenecks. The following list shows the applicable AAL for each service:

- Circuit emulation services uses AAL1.
- Frame Relay-to-ATM network interworking uses AAL5 and Frame Relay Service Specific Convergence Sublayer (FR-SSCS).
- Frame Relay-to-ATM service interworking uses both transparent and translation modes to map Frame Relay to native ATM AAL5.
- Frame Forwarding uses AAL5.
- VISM voice applications can use AAL or AAL2 for VoATM, or AAL5 for VoIP.

MGX 8830 Card Compartment

The MGX 8830 or MGX 8830/B card compartment with cards installed in both the front and back. The mechanical design accommodates both single and double-height cards.

MGX 8830 Slot Assignments

The MGX 8830 and MGX 8830/B have seven double-height front card slots, most of which also support single-height cards, and fourteen single-height back card slots. Front card slots have the following characteristics:

- Slots 1 and 2 are reserved for PXM cards
- Slots 3 through 6 (and 10 through 13) support RPM cards or service modules, and can accommodate either single or double-height cards. To install a double-height card, remove the slot divider.
- Slots 7 and 14 are reserved for SRM modules.
- For 1:N redundancy, Slots 5 and 12 are reserved for the redundant MPSM-16-T1E1 front card, and the redundancy back card. (MGX 8830/B with RCON-1TO3-8830 only)
- For 1:1 redundancy, service modules must be in adjacent slots. You can best utilize the available slots by installing redundant pairs in the bottom or top two service module slots.

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- An optional AC power tray is located at the bottom of the chassis.

Slots 1 through 7 are on the left and slots 8 through 14 are in the right, when you view the switch from the front (See Figure 1-32). Double-height front cards always use the 1 through 7 range.

Figure 1-32 MGX 8830 or MGX 8830/B Slot Assignments—Front View

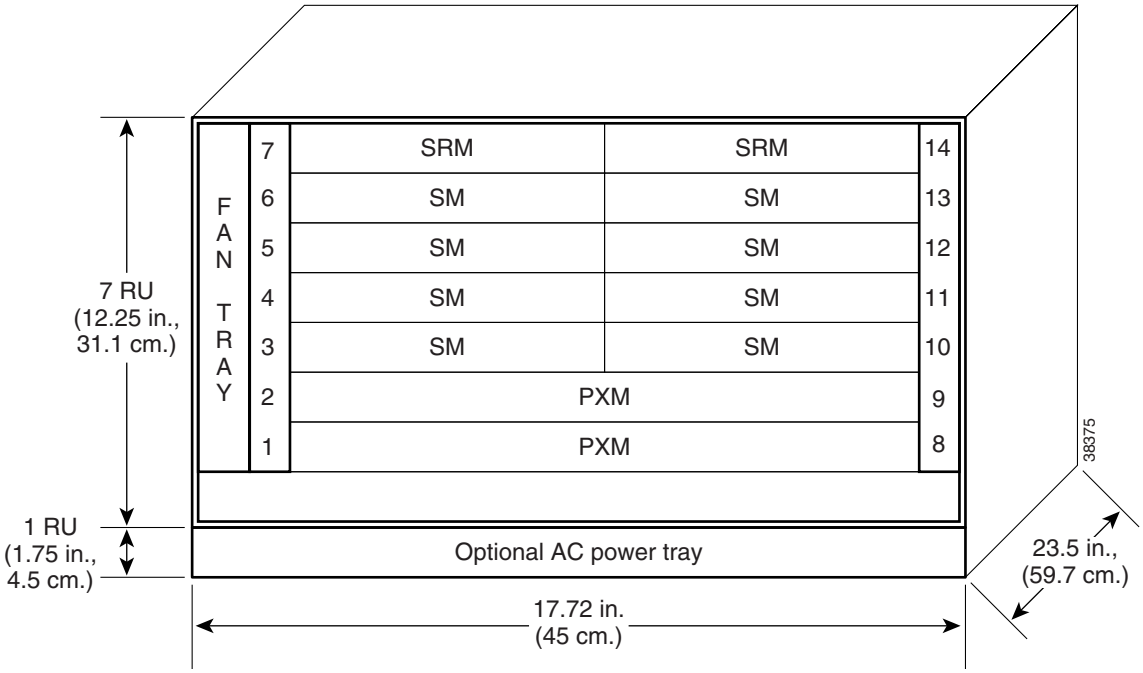
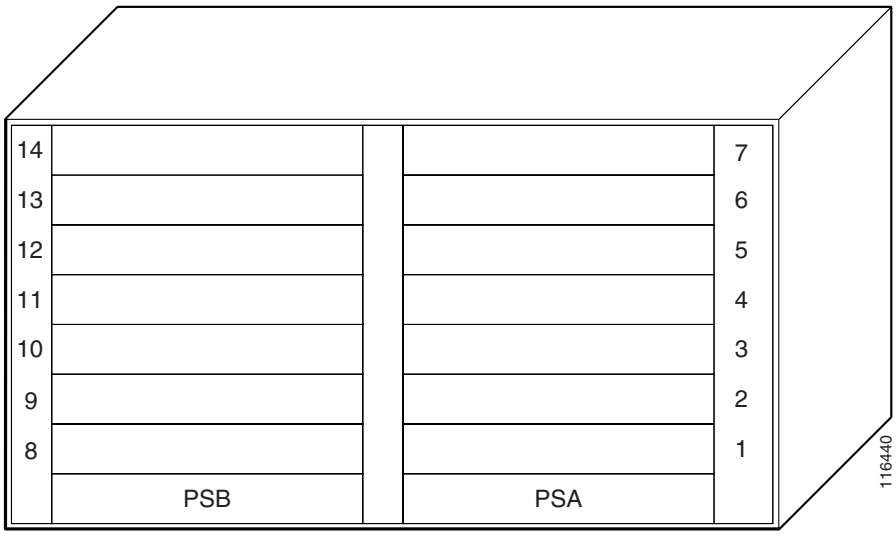


Figure 1-33 shows slot assignments (rear view) for the MGX 8830 or MGX 8830/B switch.

Figure 1-33 MGX 8830 or MGX 8830/B Slot Assignments—Rear View



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MGX 8830 Cards Supported

Table 1-3 lists the cards supported in a MGX 8830 or MGX 8830/B switch. Abbreviated card names, such as AUSM or MMC, are listed in the Glossary.

MGX 8830 System Hardware Components

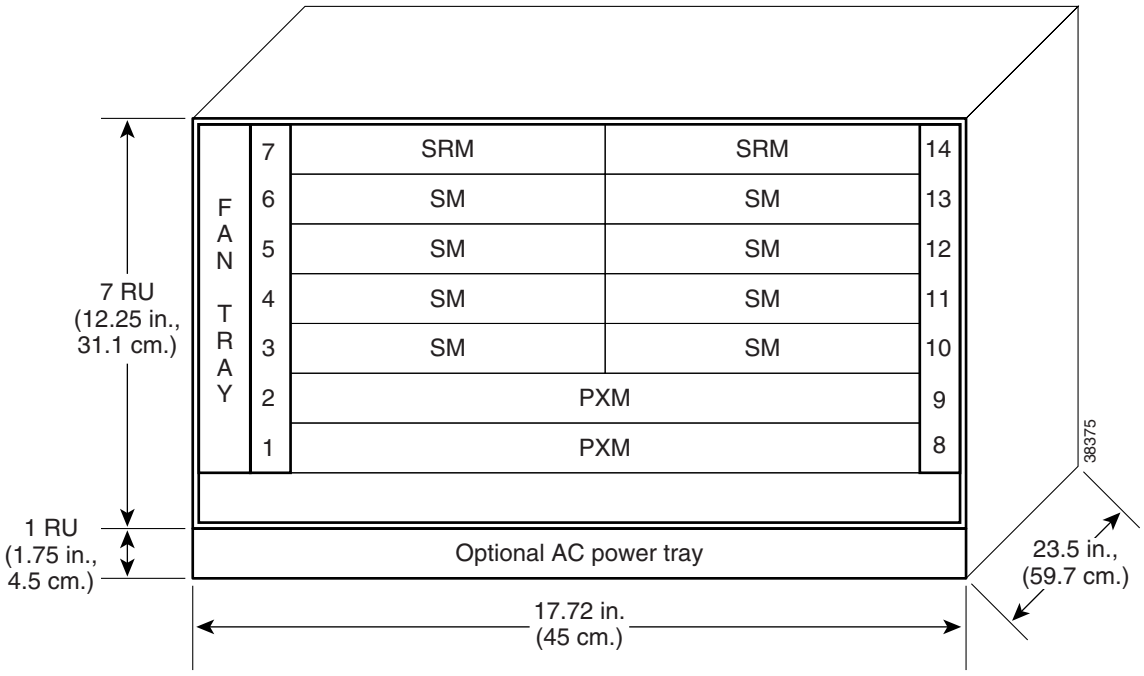
Each MGX 8830 or MGX 8830/B switch supports the following hardware components:

- AC power supply tray (optional)—with power supply modules
- APS connector—for line redundancy (optional)
- DC power entry module (PEM)
- Fan tray
- 1:N Redundancy Connector (RCON)—MGX 8830/B only (optional)

Figure 1-34 shows the hardware components that are visible from the front, which include the optional AC power supply tray at the bottom and fan tray at the left. The switch can have an optional front door installed (as shown in Figure 1-31).

Note For the switch to be EMI compliant, blank faceplates must be installed to cover any empty slots.

Figure 1-34 Hardware Component Locations for a MGX 8830 or MGX 8830/B Switch—Front View



This section provides details about the following MGX 8830 or MGX 8830/B system hardware components:

- AC Power Supply Tray, page 1-51
- APS Assembly, page 1-52

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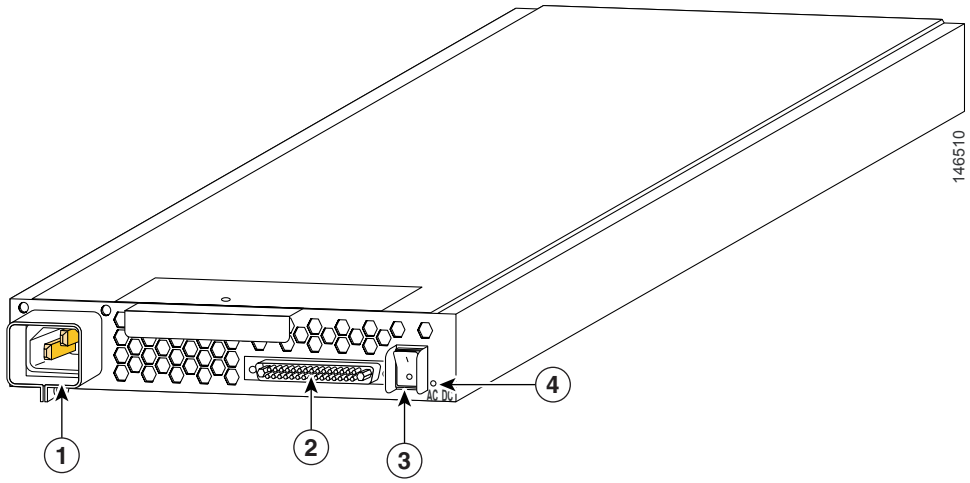
- DC Power Entry Module (PEM), page 1-54
- Fan Tray, page 1-55
- MGX 8830/B Redundancy Connector, page 1-57

AC Power Supply Tray

An optional AC power supply tray powers the MGX 8830 or MGX 8830/B switch from an AC power source (100 to 120 or 200 to 240 VAC). The AC power supply tray houses one or two AC power supplies and is installed directly below the switch. Each AC power supply module provides up to 1200 Watts of –48 VDC power, which is sufficient to power a fully-loaded MGX 8830 or MGX 8830/B switch.

Figure 1-35 Optional AC Power Supply



1	AC power receptacle, IEC 320 type (C13)	**3**	Power switch.
2	DC power connector.	**4**	AC and DC power indicators (green LEDs).

Two power supplies provide 1+1 redundancy. If no redundancy is desired, order an AC power supply tray with one AC power supply module and one AC power cord.

Note Provide at least two inches of empty space around the front and rear panels of the AC power supply for cooling air flow.

Note For AC power cord requirements, see the "Required Tools and Equipment" section on page 3-53.

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APS Assembly

For both equipment and fiber protection, 1+1 card and APS line redundancy require an APS connector (Cisco Part Number MGX-8830-APS-CON) that links the two optical back cards: an active card and a standby card. Figure 1-36 shows the MGX-8830-APS-CON.

Figure 1-36 MGX-8830-APS-CON

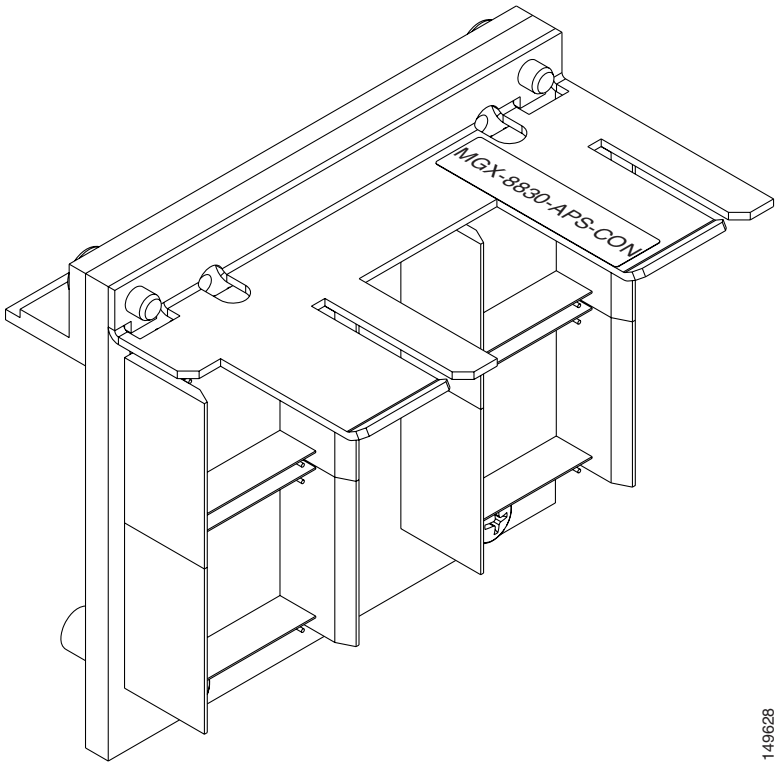

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Figure 1-37 shows an example of two back cards installed in an APS connector. Two back cards installed in an APS connector forms an APS assembly. The APS assembly is installed in the rear of the switch. For more information, see the Table 4-4

Figure 1-37 APS Assembly Example (MGX-8830-APS-CON)

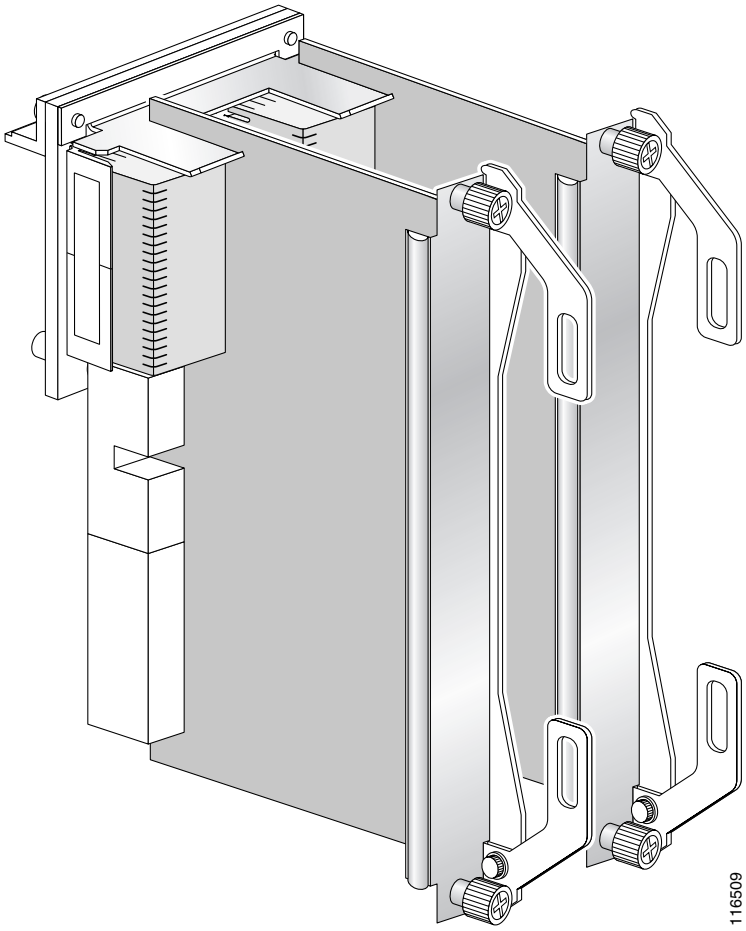

Table 1-8 lists the modules that the APS connectors support. For more information about APS options and requirements, see Table 4-4.

Table 1-8 APS Connector Support for MGX 8830 or MGX 8830/B Switch Modules

Module	MGX-8830-APS-CON (MGX 8830 and MGX 8830/B)
AXSM-2-622-E	Yes
AXSM-8-622-XG	Yes
AXSM-16-155- XG	Yes
MPSM-T3E3-155	Yes
PXM1E-4-155	Recommended
PXM1E-8-155	Yes
SRME	Yes

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Caution Although the PXM1E-4-155 does not need an APS connector to support APS line redundancy, it is recommended that you install the PXM1E-4-155 in an APS connector to support a seamless upgrade to the PXM1E-8-155 card.

For information on APS configuration, refer to the appropriate Cisco MGX release notes, or the Cisco MGX software configuration guide for your software release.

DC Power Entry Module (PEM)

The DC Power Entry Module (PEM) connects the MGX 8830 or MGX 8830/B switch to a –48 VDC (–42 to –56 VDC) power source. You can install one (primary) or two (secondary/redundant) DC PEMs. Each DC PEM must be connected to a dedicated 30 A regulated source. Figure 1-38 shows a close-up of the DC PEM faceplate.

Figure 1-38 DC PEM Faceplate

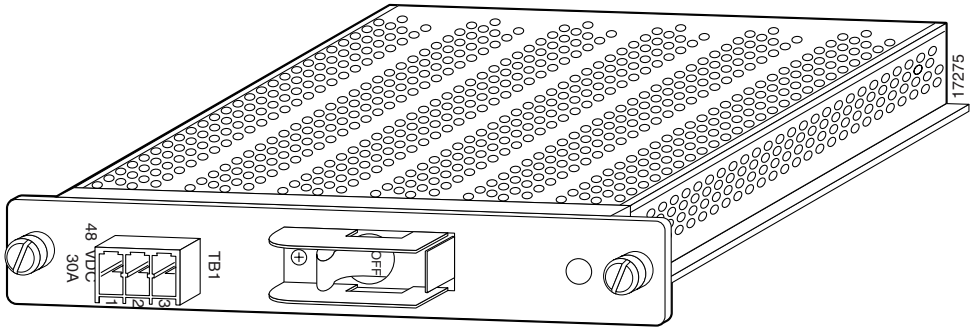
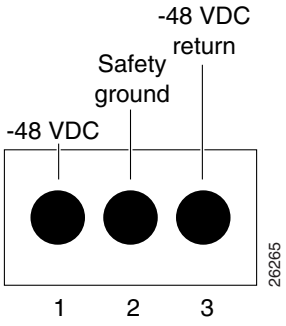


Figure 1-39 illustrates the polarity of each connection on the pluggable terminal block. The connection at the left (1) is for the –48 VDC wire. The connection in the middle (2) is the safety ground. The connection at the right (3) is for the positive return wire (for the –48 VDC).

Figure 1-39 Polarities at the MGX 8830 or MGX 8830/B PEM Pluggable Terminal Block



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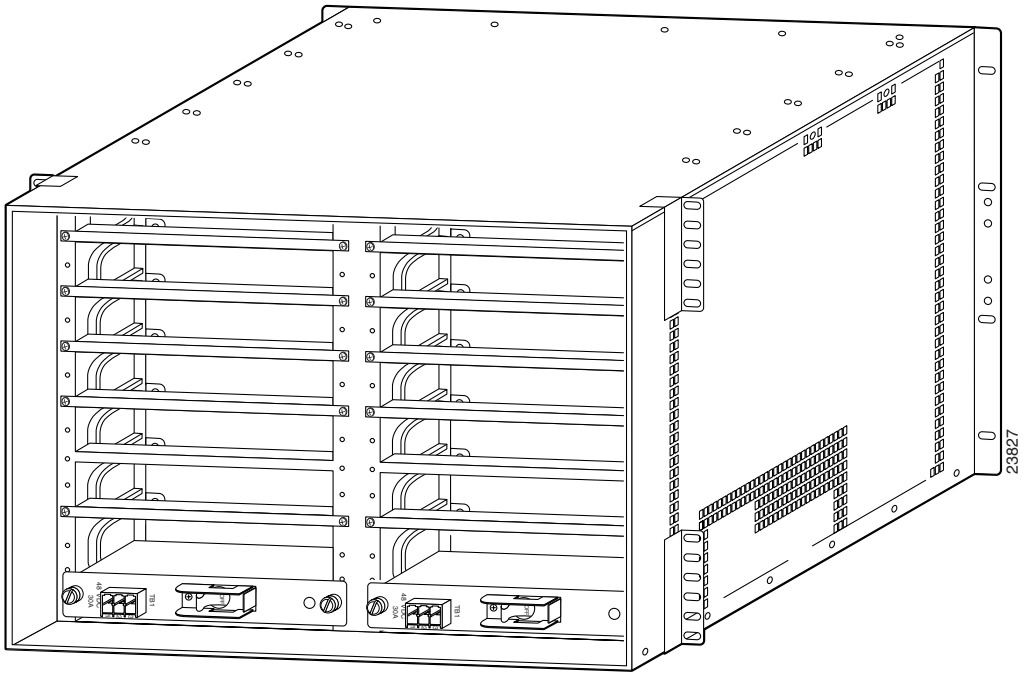
For a DC-powered system, the DC PEMs are installed at the back of the switch. (See Figure 1-40.)

On an MGX 8830 switch, it does not matter on which side the PEM is installed, and if two PEMs are installed, there is no primary or secondary PEM, unlike the PEM requirements for the MGX 8850 switches.

Figure 1-40 DC PEMs Installed in Back of the Switch



For more information about DC power requirements, see the "Power Requirements" section on page 3-17.

Fan Tray

The MGX 8830 or MGX 8830/B has a fan tray located on the left side of the switch (when it is viewed from the front). The fan tray pulls ambient cooling air into the system through openings between the front card faceplates, over the boards in the switch, and out through the air exhaust openings on the left side of the switch.

The fan tray houses eight fans that provide system cooling. The MGX 8830 or MGX 8830/B switch requires that a fan tray be installed when the system is in operation. Figure 1-34 shows the location of the fan tray in a MGX 8830 or MGX 8830/B switch.

The cooling system incorporates the following design features:

- –48 VDC fans with rotation sensing
- N+1 fan redundancy
- Hot swappable
- Noise level < 65 dBA

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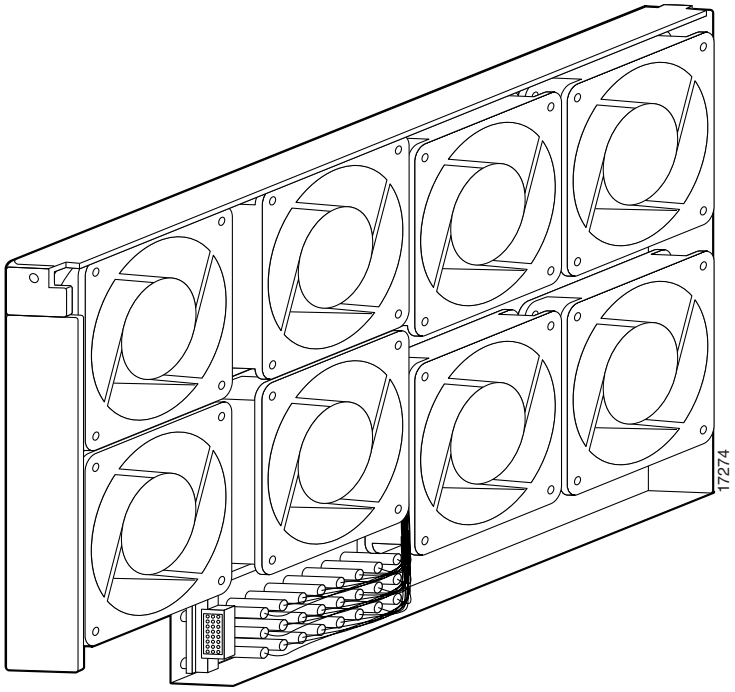
Figure 1-41 shows the fan tray.

Figure 1-41 MGX 8830 or MGX 8830/B Switch Fan Tray



Caution If a fan tray fails, replace it immediately.

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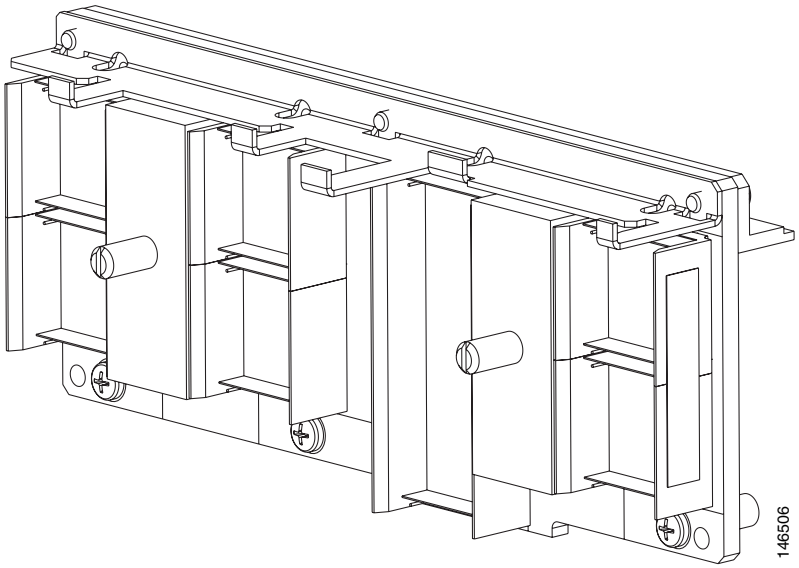
MGX 8830/B Redundancy Connector

The MGX 8830/B chassis has optional 1:3 (RCON-1to3-8850) RCONs for 1:N redundancy when using MPSM-16-T1E1 cards. A single chassis supports up to two RCONs, one in the upper and one in the lower bay. These RCONs are keyed to ensure that back cards are inserted properly.

Figure 1-42 show the 1:3 (RCON-1to3-8850) assembly.

Figure 1-42 RCON-1TO3-8830 RCON Connector



To install or remove RCONs, see Installing or Removing Redundancy Connectors, page 6-22.

Cisco MGX 8880 Media Gateway

A discussion of the MGX 8880 Media Gateway (shown in Figure 1-2) requires an introduction to the Voice Switch Service Modules (VXSMs). The MGX 8880 Media Gateway and VXSM cards were introduced in MGX Release 5.

Voice Switch Service Module Overview

The Cisco Voice Switch Service Module (VXSM) is the next-generation voice module for the MGX 8880 Media Gateway and MGX 8000 Series Multiservice Switches. The VXSM is a high-density voice module designed for ultimate compatibility with the Cisco MGX 8880 Media Gateway. The Cisco VXSM offers high availability, scalable and robust voice features for wireless, wireline, and cable applications.

The Cisco VXSM is a high-density voice service module with time-division multiplexing (TDM) interfaces ranging from T1/E1, T3, to Channelized OC-3/STM-1. It provides service providers with carrier-class capabilities for high capacity and reliability for voice over IP (VoIP) services. The Cisco VXSM supports up to 8064 DS-0s and can protect active voice calls if scheduled or unscheduled outages occur.

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The Cisco VXSM architecture combines a high-performance voice services engine with onboard digital signal processors to provide advanced voice processing and features that allow quick development and deployment of VoIP services. The Cisco VXSM offers carrier-grade voice quality with a full suite of voice, modem, and fax features.

Together with a softswitch, the Cisco VXSM provides maximum deployment flexibility for various packet voice networks based on the Media Gateway Control Protocol (MGCP), PacketCable™ Trunking Gateway Control Protocol (TGCP), H.248, H.323, and the Session Initiation Protocol (SIP). The innovative Cisco VXSM architecture provides investment protection, because new functions and services can easily be added through software upgrades.

The supported VXSM cards are:

- MGX-VXSM-4-155 front card (4 OC3/STM-1)
- MGX-VXSM-48T1E1front card
- MGX-VXSM-T3 front card
- VXSM-BC-24T1E1 24T1/E1 back card
- VXSM-BC-4-155 4OC3 back card
- VXSM-BC-3T3 back card
- VXSM-R-BC redundant back card

Y cabling is supported with the VXSM-48T1E1 and VXSM-T3 cards.

MGX 8880 Media Gateway Overview

The Cisco MGX 8880 Media Gateway hardware has the same dimensions and same basic slot configuration as the MGX 8850 multiservice switch. The MGX 8880 also fits in a 19-inch or a 23-inch rack. However the MGX 8880 gateway has the following important differences:

- The MGX 8880 uses the PXM45/C controller card *only.*
- The MGX 8880 uses new fans.
- The DC version of the MGX 8880, with its low profile cooling system, enables three gateways to fit in a rack.
- The MGX 8880 uses a new integrated redundancy connector (RCON) on the upper and lower right (when viewed from the rear of the chassis).
- The MGX 8880 uses Voice Switch Service Modules (VXSMs).
- The MGX 8880 hardware implements color coding and mechanical keying to ensure correct insertion of SRME/B cards, the PXM45/C processor cards, and the fan tray cable.

Note Information in this section is extracted from the current *Cisco Voice Service Switch Module* data sheet as of April 2004. Please check online data sheets and release notes for the latest information.

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Features and Benefits

Table 1-9 lists the features and benefits of the Cisco VXSM.

Table 1-9 VXSM Features and Benefits

Feature	Benefit
High density	• Scales up to 8064 VoIP DS-0s per service module • Lowers capital expenditures and operating expenses by maximizing density per platform • Allows 40,320 VoIP DS-0s per chassis and 120,960 VoIP DS-0s per rack, with echo cancellation
TDM interfaces	• Offers scalable optical interfaces; available with 2- or 4-port OC-3/STM-1 interfaces per service module • Provides scalable electrical interfaces; up to 48 T1/E1 interfaces per service module
High availability	Ensures carrier-class reliability by providing active call preservation
Integrated nonblocking architecture	Lowers entry, scaling, and operations cost by integrating TDM, network processing, and digital-signal-processor (DSP) technology onto a single module

Table 1-10 lists specifications for VXSM features.

Table 1-10 VXSM Feature Specifications

Feature	Description
Call control	H.248, MGCP, TGCP
Signaling interfaces	Signaling System 7 (SS7) and Inter-Machine Trunk (IMT); ISDN Primary Rate Interface (PRI)
Voice compression	G.711, G.726, G.729a/b, Clear Channel
Voice features	• G.165, G.168-2000 integrated, nonblocking echo cancellation; programmable up to 128 ms • Transparent transcoding between a-law and µ-law encoding • Voice Activity Detection, Silence Suppression, and Comfort Noise Generation • Fixed and Adaptive Jitter Buffering • Tone detection and regeneration including dial tone, busy, ring back, and congestion with local country variants; programmable tones • Dual Tone Multi Frequency (DTMF) relay (RFC 2833)
Modem and Fax	• Fax and modem pass-through • T.38 Fax Relay
IP	• Real-time Transport Protocol (RTP) (RFC 1889), DTMF Relay (RFC 2833), Differentiated Services (DiffServ) aware
ATM	Standards-based ATM Adaptation Layer 2 (AAL2)

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Table 1-10 VXSM Feature Specifications (continued)

Feature	Description
Announcements	Onboard announcement storage and playout
Lawful intercept	Lawful intercept (Communications Assistance for Law Enforcement Act [CALEA]) support for call content
Emergency Services	Handling of E911 emergency calls
Security	Bearer and Signaling security on VoIP calls
Management interfaces	• Simple Network Management Protocol (SNMP) • Command Line Interface (CLI) • Telnet • Secure Shell (SSH) Protocol • FTP

MGX 8880 Card Compartment

The Cisco MGX 8880 gateway has 32 single-height slots in a compartment card cage that holds cards and modules. Some single-height slots can be converted to double-height slots by removing the service module slot dividers.

Each slot on the front of the gateway is numbered and has a corresponding slot located on the back of the gateway. There are 32 front card slots and 32 back card slots. Slots 1 through 16 are in the top bay and slots 17 through 32 are in the bottom bay.

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MGX 8880 Slot Assignments

Table 1-3 describes module slot assignment for the Cisco MGX 8880 Media Gateway.

Figure 1-43 shows module slot assignments (front view) for the Cisco MGX 8880 Media Gateway.

Figure 1-43 Cisco MGX 8880 Media Gateway Slot Assignments—Front View

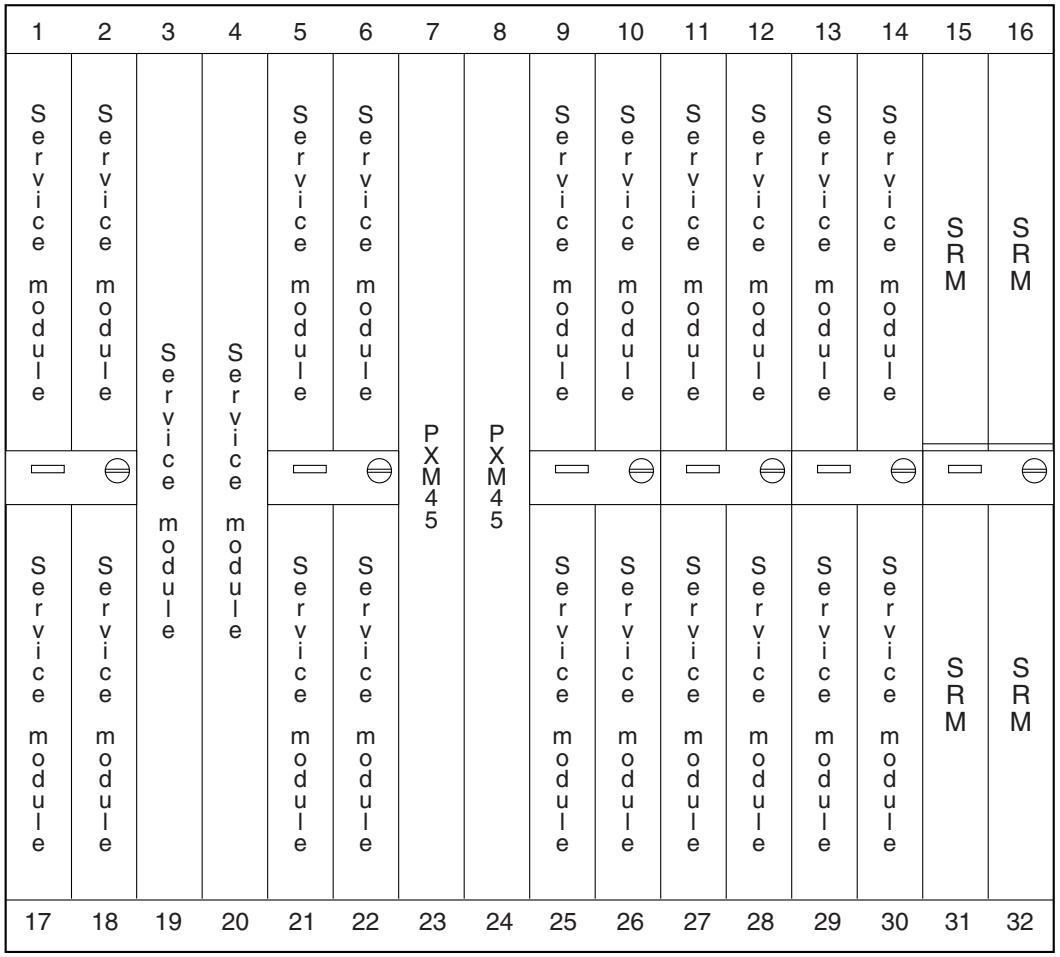

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Figure 1-44 shows slot assignments (rear view) for the Cisco MGX 8880 Media Gateway.

Figure 1-44 Cisco MGX 8880 Media Gateway Slot Assignments—Rear View

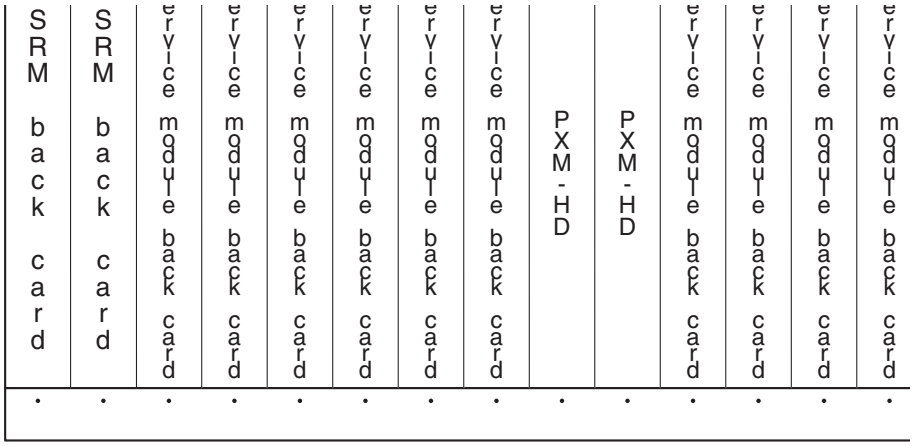

Figure 1-45 shows a fully configured MGX 8880 for OC-3. Note that the Network Interface Card in this figure can be IP or ATM packet interface cards (for example, RPM-XF, AXSM).

Note Service modules such as the RPM-XF, AXSM, or VISM-PR must be inserted into slots that are not covered by the factory-installed RCON.

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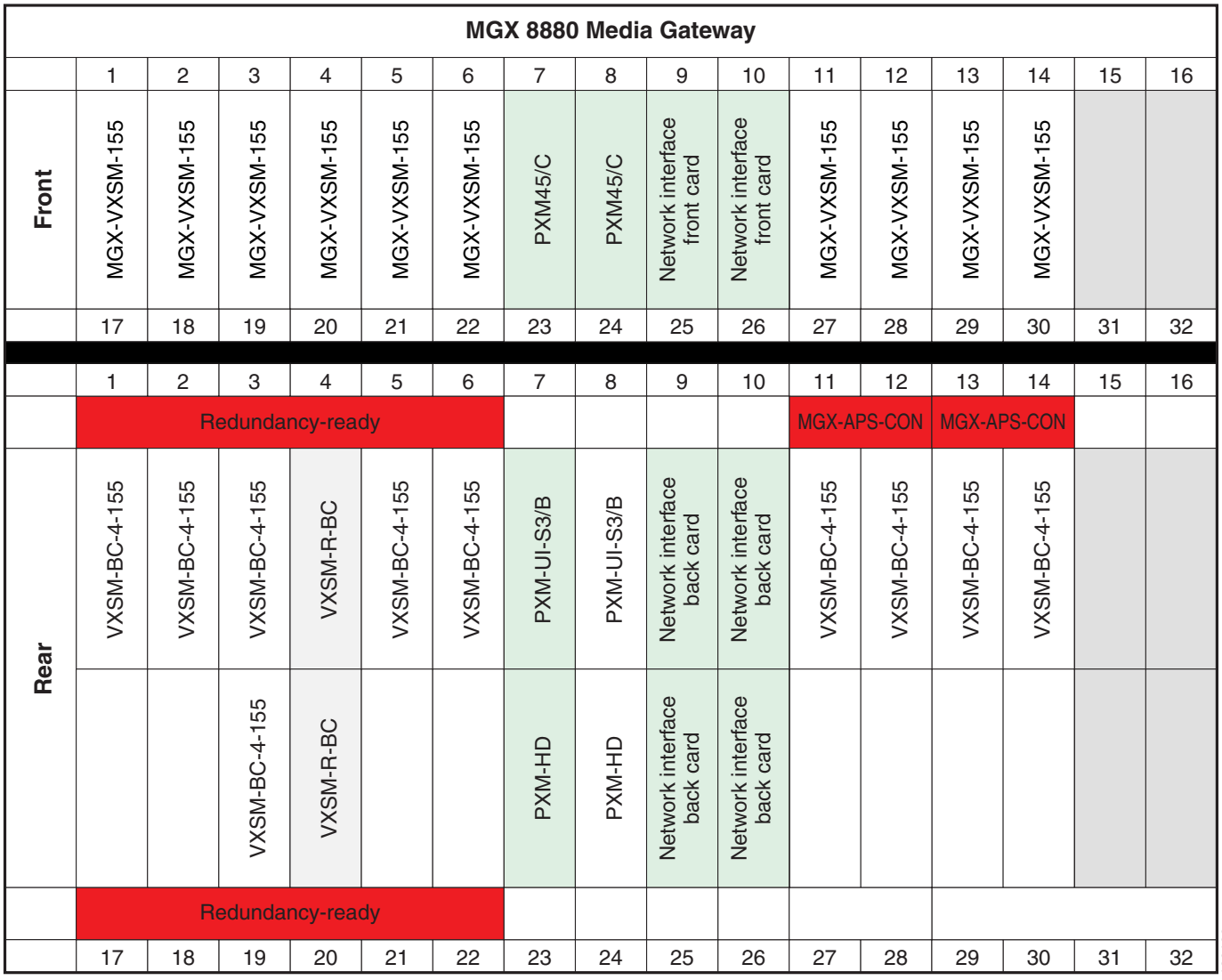
Figure 1-45 Example of an MGX 8880 Media Gateway, Fully Configured with VXSM OC-3/STM-1



MGX 8880 Cards Supported

The Cisco MGX 8880 Media Gateway supports the following module types:

- ATM switching service module (AXSM)—Double-height front card
  - AXSM/E (for T1/E1 only) (existing cards as of Release 5)
  - AXSM/B (T3/E3 to OC-48) (existing cards as of Release 5)
- VXSM voice switch service module (4-OC3, 48 T1/E1, 6T3) and back cards
- VISM-PR—Single-height front card (existing card as of Release 5)

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- RPM-XF—Double-height front card and 2 GE, 2 POS back cards, and UI + back cards (existing module, with new back cards as of Release 4.0.15)
- RPM-PR (512M only)—Double-height front card (existing card as of Release 5)
- SRME/B—Single-height front card (new card in Release 5)

Note The only SRM supported in the Cisco MGX 8880 is the SRME/B, and it is used in conjunction with the VISM-PR cards.

Table 1-11 lists specific cards supported in a Cisco MGX 8880 Media Gateway. Card name abbreviations, such as SMFXLR or RPM-XF, are listed in the Glossary.

The initial *R-* on some back cards means that this is a *redundant* back card, which is used for 1:N card set redundancy without bulk distribution.

Table 1-11 Cards Supported in a Cisco MGX 8880 Media Gateway

Front Card	Back Card
AXSM-1-2488/B	• SMFLR-1-2488/B • SMFSR-1-2488/B • SMFXLR-1-2488/B
AXSM-4-622/B	• SMFIR-2-622/B • SMFLR-2-622/B
AXSM-16-155/B	• MMF-8-155-MT/B • SMB-4-155 • SMFIR-8-155-LC/B • SMFLR-8-155-LC/B
AXSM-16-T3E3/B	• SMB-8E3 • SMB-8T3
AXSM-32-T1E1-E	• MCC-16-E1 • RBBN-16-T1E1
MPSM-T3/E3-155	• BNC-3-T3E3
PXM45/C	User interface back card: • PXM-UI-S3/B Hard drive card: • PXM-HD
RPM-PR-512	• MMF-FE • RJ45-4E/B • RJ45-FE

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Table 1-11 Cards Supported in a Cisco MGX 8880 Media Gateway (continued)

Front Card	Back Card
RPM-XF-512	Management back card: • MGX-XF-UI Physical network connectivity back cards: • MGX-1OC12POS-IR • MGX-2OC12POS-IR Transceivers for the 2OC12POS-IR: – SMFIR-622-SFP – SMFLR-622-SFP • MGX-1GE Transceivers for the MGX-1GE: – MGX-GE-LHLX – MGX-GE-SX – MGX-GE-ZX • MGX-2GE Transceivers for the MGX-2GE: – GLC-SX-MM – GLC-LH-SM – GLC-ZX-SM
SRME/B	• SMFIR-1-155 • STM1-EL-1
VISM-PR-8E1	• MGX-RJ48-8E1 (for use in Australia) • RJ48-8E1 • R-RJ48-8E1 • SMB-8E1 • R-SMB-8E1
VISM-PR-8T1	• RJ48-8T1 • R-RJ48-8T1
VXSM-4-155	• VXSM-BC-4-155 • VXSM-R-BC
VXSM-48T1E1	• VXSM-BC-24T1E1 • VXSM-R-BC
VXSM-T3	• VXSM-BC-3T3 • VXSM-R-BC

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MGX 8880 Hardware Components

The MGX 8880 Media Gateway supports the following hardware components:

- AC power supply tray (optional)—With power supply modules
- Air intake plenum (3.5 inches, 2RU)
- APS connector—For line redundancy (optional)
- DC power entry module (PEM)
- Exhaust plenum (a combined exhaust plenum and fan tray, 3.5 inches, 2 RU)
- Redundancy connector (RCON-1TO5-8850), a keyed, built-in RCON that enables redundancy for the cards in slots 1–6 and 17–22. See "How the Built-in MGX 8880 Redundancy Connector Affects Module Configurations" section on page 1-73 for more information.

Figure 1-46 shows the hardware components that can be used with a Cisco MGX 8880 Media Gateway (viewed from the front). This illustration also shows the optional AC power supply tray installed at the bottom of the system. The gateway can have an optional front door installed (as shown in Figure 1-46).

For the gateway to be EMI compliant, either the optional front door must be installed on the gateway or blank faceplates must be installed to cover any empty slots.

Note The DC PEM is installed at the rear of the chassis. The APS assembly is not visible in the illustration because it is installed inside the card cage.

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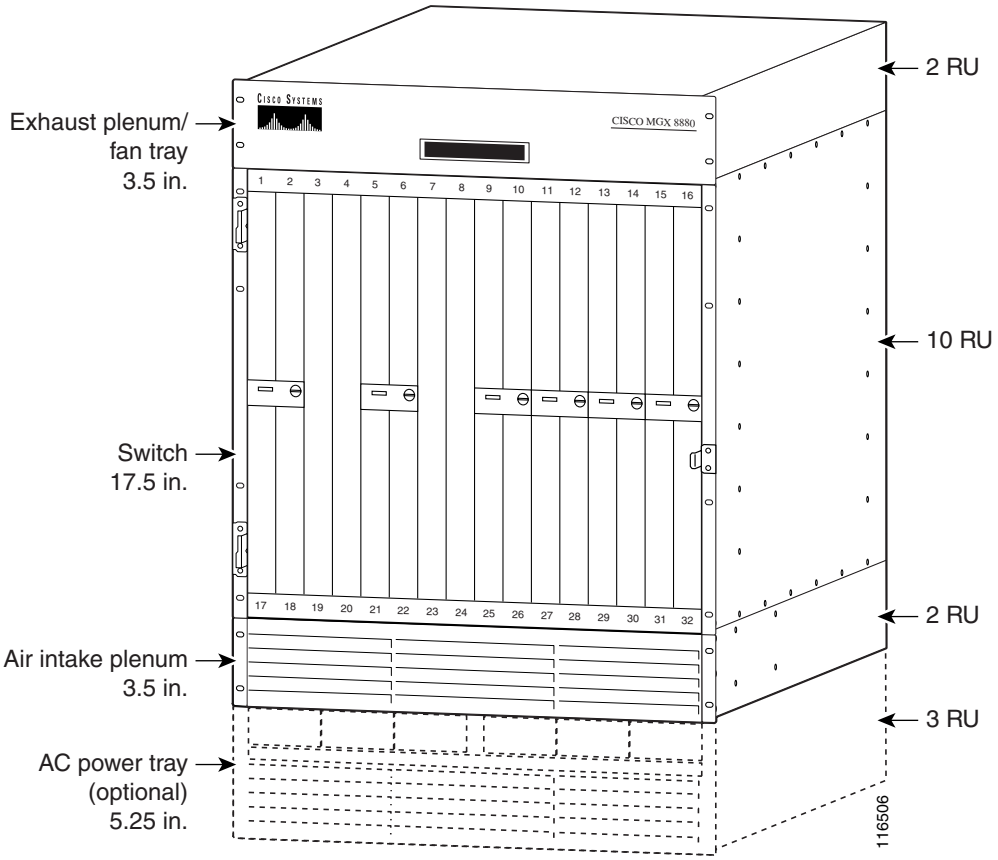
Figure 1-46 Hardware Component Locations for a Cisco MGX 8880 Media Gateway—Front View



This section provides details about the following Cisco MGX 8880 Media Gateway hardware components:

- AC Power Supply Tray, page 1-68
- Air Intake Plenum, page 1-70
- APS Assembly, page 1-71
- DC Power Entry Module (PEM), page 1-72
- Exhaust Plenum/Fan Tray, page 1-73
- MGX 8880 Redundancy Connector, page 1-73

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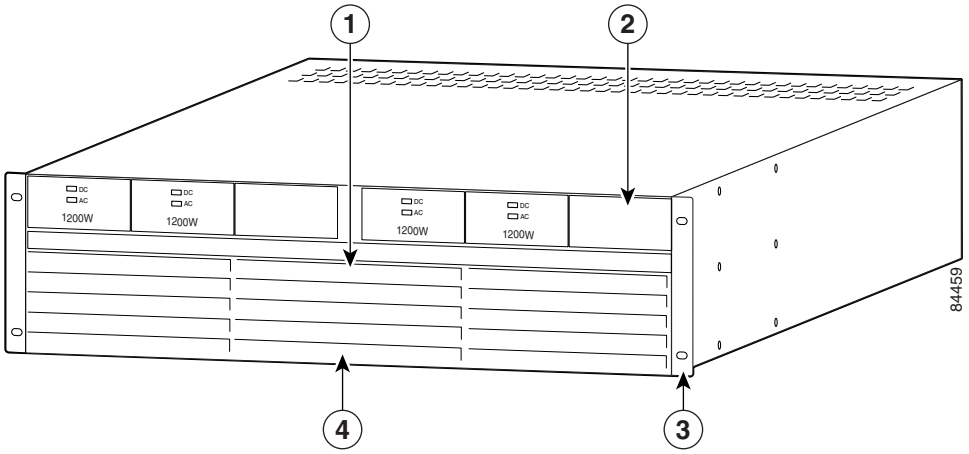
AC Power Supply Tray

The Cisco MGX 8880 gateway can accept power from a 220-VAC (180- to 254-VAC) source that connects to an optional AC power supply tray, shown in Figure 1-47. The optional AC power supply tray houses up to six AC power supplies and is installed directly below the air intake plenum. The AC power supplies convert 220 VAC to –48 VDC power for the gateway.

Figure 1-47 Optional AC Power Supply Tray



1	Release	**3**	Front flange
2	Blank panel	**4**	Air intake grille

Note Figure 1-47 shows four AC power supplies installed in the AC power supply tray.

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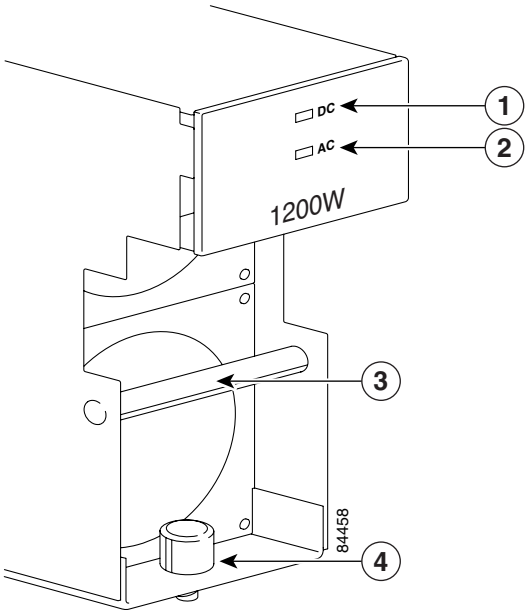
Figure 1-48 shows a close-up of the AC power supply faceplate.

Figure 1-48 AC Power Supply Faceplate



1	DC okay LED—Green	**3**	Handle
2	AC okay LED—Green	**4**	Captive screw

The AC power supply requirements for the gateway depend on the following criteria:

- The number of service modules installed in the gateway
- Whether the gateway is a single AC power cord system or a dual AC power cord system

Use the guidelines in Table 1-12 for the AC power supply requirements.

Table 1-12 AC Power Supply Requirements for the MGX 8880 Media Gateway

Number of Service Modules Installed		
Double-Height	**Single-Height**	**Number of Power Supplies Required per gateway**
1 to 5	1 to 10	2 AC power supplies (minimum) for a dual or a single AC power cord system
6 to 10	11 to 20	4 AC power supplies (minimum) for a dual AC power cord system (2 on each power cord) 3 AC power supplies (minimum) for a single AC power cord system
11 or more	21 or more	6 AC power supplies for a dual AC power cord system 4 AC power supplies for a single power cord system

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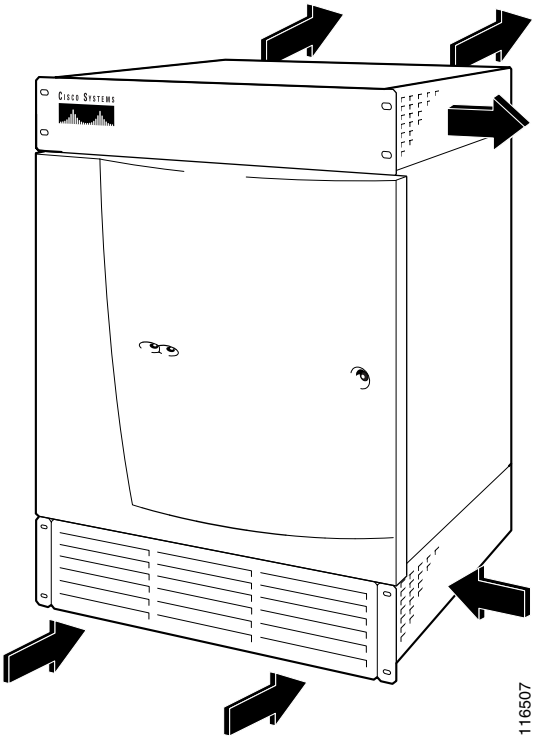
Note For AC power cord requirements, see the "Required Tools and Equipment" section on page 3-67.

Air Intake Plenum

The air intake plenum is installed below the chassis (see Figure 1-49 for location). The exhaust plenum/fan tray pulls up through the modules to cool the modules. Then the air is forced up and out of the exhaust plenum, as shown in Figure 1-49.

Figure 1-49 Air Flow through the Cisco MGX 8880 System



The MGX 8880 Media Gateway uses an air intake plenum that allows you to replace the filter.

Note Cisco does not provide replacement filters for the MGX 8880. For information about replacing an air filter, see "Replacing the Air Intake Plenum Filter" section on page 6-13.

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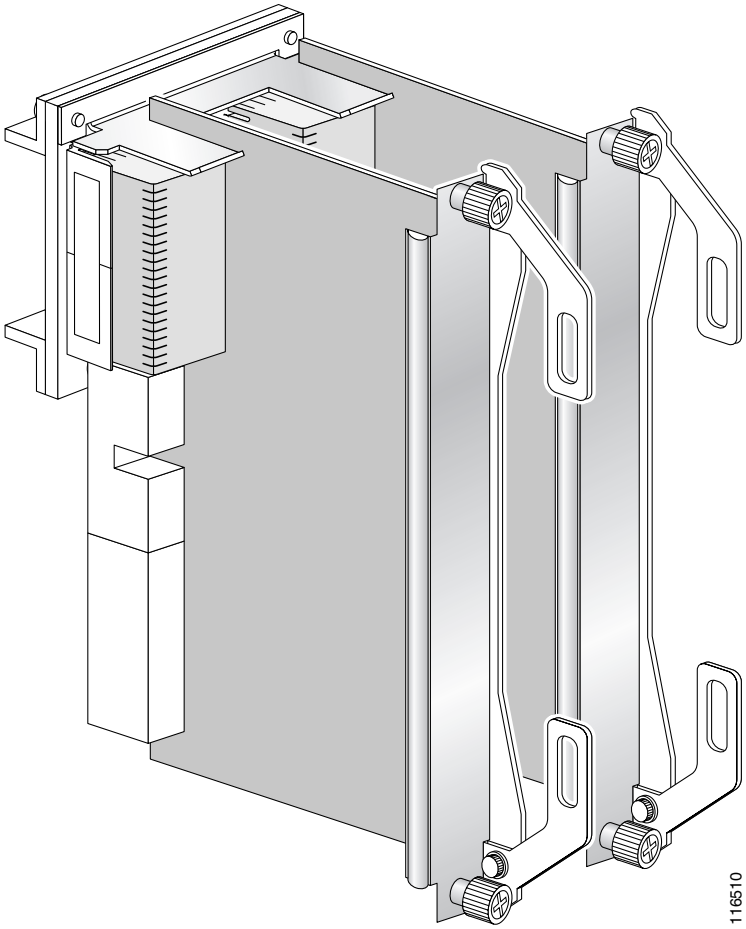
APS Assembly

For both equipment and fiber protection, the 1+1 card and APS line redundancy configuration requires that an APS connector link two optical back cards: an active card and a standby card. Figure 1-50 shows an example of two back cards installed in an APS connector. When the two back cards are linked to an APS connector, they form an APS assembly. The APS assembly is installed in the rear of the switch. For more information, see Table 4-4.

Figure 1-50 APS Assembly Example for MGX 8880



Two APS connectors are available for the Cisco MGX 8880 switch: Cisco Part Number MGX-8850-APS-CON or MGX-APS-CON. Table 1-13 lists module support for APS connectors.

Table 1-13 APS Connector Support for MGX 8880 Modules

Module	MGX-8850-APS-CON	MGX-APS-CON
AXSM-1-2488/B	Yes	Yes
AXSM-4-622/B	Yes	Yes
AXSM-16-155/B	Yes	Yes
SRME/B	No	No

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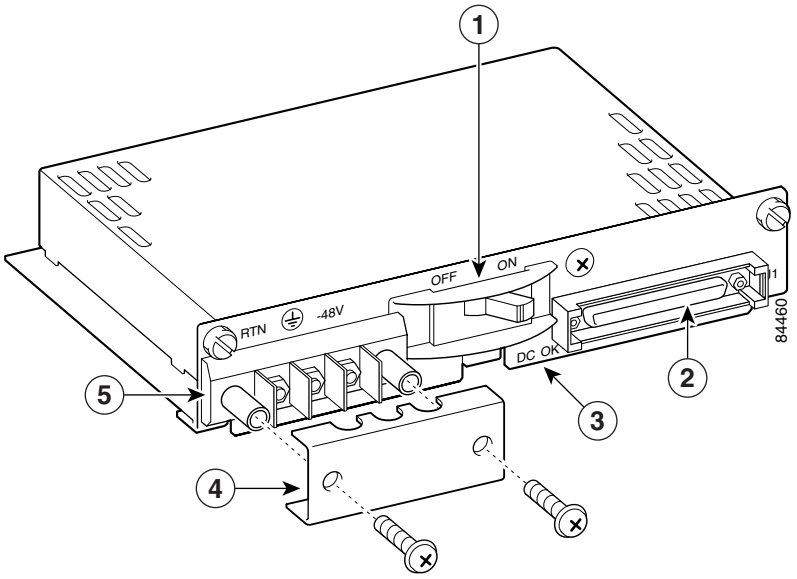
For information on APS software configuration, refer to the software configuration guide that matches your MGX switch name and release. The "Obtaining Documentation" section explains how to find these documents online

DC Power Entry Module (PEM)

The Cisco MGX 8880 gateway can accept power from a –48 VDC (–42 to –56 VDC) source that connects to one (primary) or two (secondary/redundant) –48 VDC PEMs. Each DC PEM must be connected to a dedicated 60 A regulated source. Figure 1-51 shows a close-up of the DC PEM faceplate.

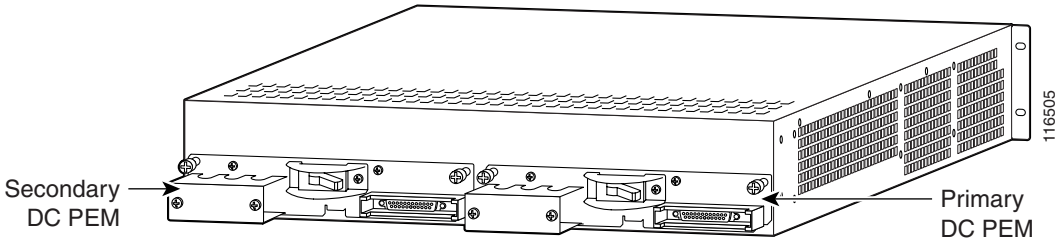
Figure 1-51 DC PEM Faceplate



1	Two-position circuit breaker. The positions are Off and On.	**4**	Plastic cover.
2	J1 output connector.	**5**	Terminal block 1 (DC input).
3	Green LED showing status of the DC PEM.		

For a DC-powered system, the DC PEMs are installed at the back of the air intake plenum. If you install only one DC PEM, install it on the right, as viewed from the rear of the air intake plenum. (See Figure 1-52.)

Figure 1-52 DC PEMs Installed in Back of the Air Intake Module



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For more information about DC power requirements, see the "Power Requirements" section on page 3-62.

Exhaust Plenum/Fan Tray

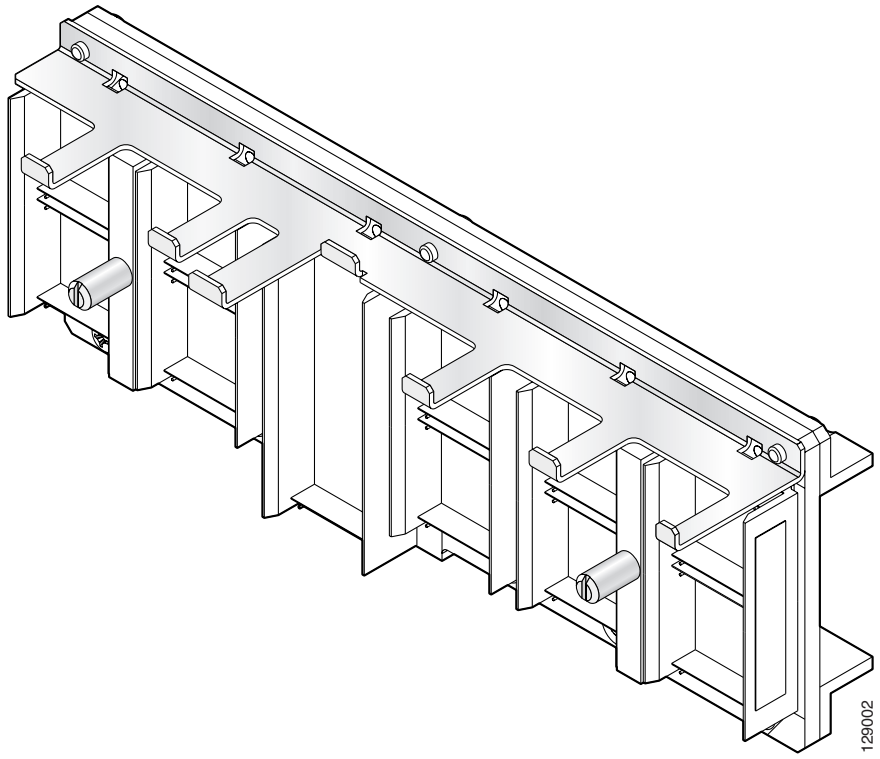
The 2RU exhaust plenum/fan tray for the MGX 8880 is installed above the chassis (see Figure 1-46 for location). The plenum/fan tray pulls air up through the modules to cool the modules. Then the air is forced out of the exhaust plenum/fan tray, as shown in Figure 1-49.

Caution If a fan tray fails, replace it immediately.

MGX 8880 Redundancy Connector

The MGX 8880 Media Gateway ships with two built-in redundancy connectors (RCONs). These RCONs are installed on the upper right and lower right bays of the chassis when viewed from the rear, They support cards in slots 1–6 and 17–22. These RCONs are keyed to ensure cards are inserted properly (see Figure 1-53).

Figure 1-53 RCON-1TO5-8850 RCON Connector



How the Built-in MGX 8880 Redundancy Connector Affects Module Configurations

You can order two more connectors (RCON-1TO5-8850) for the upper left and lower left bays, if you wish to fill the entire chassis with redundant connectors.

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As shipped, an MGX 8880 chassis could have up to six VXSM-4-155 or VXSM-48T1E1 cards in slots 1 through 6. These slots are covered by the installed RCONs, which currently support VXSM 1:1 redundancy.Up to four RPM-XF cards could go in slots 9 through 12. Or additional VXSM cards could go in slots 9 through 14 (and 1:1 redundancy would be supported).

The RCON-1TO5-8850 has built-in APS function for slot pairs 1 and 2, 5 and 6 (upper bay), and 17 and 18, 21 and 22 (lower bay). The RCON has virtual APS backplane function for slot pairs 3 and 4, and 19 and 20. So there is no need for MGX-APS-CON in these slots.

The RCON provides 1:1 redundancy support for slot pairs 3 and 4, and slot pairs 19 and 20, in conjunction with the VXSM Redundancy back card. Slots supported by the RCON-1TO5-8850 connector can support 1:N.

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Illustrated Card List for MGX Switches and the MGX 8880 Media Gateway

How to Use the Illustrated Card List

This chapter includes tables that define which front cards are supported in each MGX switch or gateway, and the MGX Release number in which each card was introduced.

Card Naming Conventions

MGX cards contain meaning in their names. In these tables, abbreviated card names such as *AUSM*, *FRSM*, *SMFLR*, and more are listed in the Glossary. In addition, the *R-* prefix on some back card names (e.g., R-SMB-8E1) means that this is a *redundant* back card, which is used for 1:N card set redundancy without bulk distribution.

Card Organization

First, tables of cards by MGX switch or gateway name appear. These tables are followed by the front and back cards, listed alphabetically. The cards' function is described and their faceplates are illustrated. For consistency and usability in this document, the front cards and back cards are identified by the name printed on the faceplate.

Tip The heading for each front card includes which MGX switch or gateway uses the card. So, in addition to using the following tables of cards by MGX switch or gateway name, scanning the Table of Contents for Chapter 2 is a quick way to see which front cards are supported on which switch or gateway.

Finding the Latest Card Information

For the latest updates on card support and features by switch or gateway, please refer to the release notes for your product. MGX release notes for releases 2 and higher are listed at the following locations:

- MGX 8850 (PXM45) release notes:
  http://www.cisco.com/univercd/cc/td/doc/product/wanbu/8850px45/relnote/index.htm
- MGX 8850 (PXM1E) release notes:
  http://www.cisco.com/univercd/cc/td/doc/product/wanbu/8850px1e/relnote/index.htm

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- MGX 8950 release notes: http://www.cisco.com/univercd/cc/td/doc/product/wanbu/mgx8950/relnotes/index.htm
- MGX 8830 release notes: http://www.cisco.com/univercd/cc/td/doc/product/wanbu/mgx8830/relnotes/index.htm

For module configuration overviews, refer to Chapter 4, "Planning for Card Redundancy, Line Redundancy, and Bulk Distribution".

Note The information in this guide does not apply to the MGX 8850 (PXM1) switch. For information about that switch, refer to: http://www.cisco.com/univercd/cc/td/doc/product/wanbu/mgx8250/index.htm

MGX 8850 (PXM45) or MGX 8850/B (PXM45) Card Overview

MGX 8850 (PXM45) or MGX 8850/B (PXM45) front cards and compatible back cards are listed in Table 1-3 on page 1-7.

Table 2-1 lists the front cards supported in a MGX 8850 (PXM45) or MGX 8850/B (PXM45) switch, the MGX release in which the front card support was introduced, and a reference to a section with more details on the cards.

Table 2-1 Release History of MGX 8850 (PXM45) or MGX 8850/B (PXM45) Switch Front Cards

Front Card		MGX Software Release When First Supported	Reference Section
Name Printed on the Faceplate	Cisco Product ID		
AXSM-1-2488	AXSM-1-2488	Release 2.0.01	AXSM, page 2-13
AXSM-1-2488/B	AXSM-1-2488/B	Release 2.1.60	
AXSM-2-622-E	AXSM-2-622-E	Release 2.1.60	
AXSM-4-622	AXSM-4-622	Release 2.0.01	
AXSM-4-622/B	AXSM-4-622/B	Release 2.1.10	
AXSM-8-155-E	AXSM-8-155-E	Release 2.1.60	
AXSM-8-622-XG	AXSM-8-622-XG	Release 5.2.00	
AXSM-16-155	AXSM-16-155	Release 2.0.01	
AXSM-16-155/B	AXSM-16-155/B	Release 2.0.10	
AXSM-16-155-XG	AXSM-16-155-XG	Release 5	
AXSM-16-T3E3	AXSM-16-T3E3	Release 2.0.01	
AXSM-16-T3E3/B	AXSM-16-T3E3/B	Release 2.1.10	
AXSM-16-T3E3-E	AXSM-16-T3E3-E	Release 2.1.60	
AXSM-32-T1E1-E	AXSM-32-T1E1-E	Release 3.0.10	
CESM-8E1	AX-CESM-8E1	Release 4.0.00	CESM, page 2-23
CESM-8T1	AX-CESM-8T1	Release 4.0.00	
CESM-8T1/B	AX-CESM-8T1/B	Release 4.0.00	

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Table 2-1 Release History of MGX 8850 (PXM45) or MGX 8850/B (PXM45) Switch Front Cards

Front Card		MGX Software Release When First Supported	Reference Section
Name Printed on the Faceplate	**Cisco Product ID**		
FRSM-2CT3	MGX-FRSM-2CT3	Release 4.0.00	FRSM, page 2-27
FRSM-2T3E3	MGX-FRSM-2T3E3	Release 4.0.10	
FRSM-8E1	AX-FRSM-8E1	Release 4.0.00	
FRSM-8E1-C (the channelized version of the front card)	AX-FRSM-8E1-C	Release 4.0.00	
FRSM-8T1	AX-FRSM-8T1	Release 4.0.00	
FRSM-8T1-C (the channelized version of the front card)	AX-FRSM-8T1-C	Release 4.0.00	
FRSM-12-T3E3	FRSM-12-T3E3	Release 3.0.00	FRSM-12-T3E3, page 2-34
FRSM-HS2/B	MGX-FRSM-HS2/B	Release 4.0.10	FRSM, page 2-27
MPSM-8-T1E1	MPSM-8-T1E1	Release 5.0.10	MPSM-8-T1E1, page 2-38
MPSM-T3E3-155	MPSM-T3E3-155	Release 5.0.10	MPSM-T3E3-155, page 2-39
MPSM-16-T1E1	MPSM-16-T1E1	Release 5.1	MPSM-16-T1E1, page 2-42
PXM45	PXM45	Release 2.0.01	PXM45, page 2-57
PXM45/B	PXM45/B	Release 2.0.14	
PXM45/C	PXM45/C	Release 4.0.00	
RPM-PR-256	MGX-RPM-PR-256	Release 2.1.00	RPM-PR, page 2-62
RPM-PR-512	MGX-RPM-PR-512	Release 2.1.00	
RPM-XF-512	MGX-RPM-XF-512	Release 3.0.10	RPM-XF, page 2-65
SRME	MGX-SRME	Release 3.0.10	SRME, page 2-71
SRME/B	MGX-SRME/B	Release 5	
VISM-PR-8E1	MGX-VISM-PR-8E1	Release 3.0.00	VISM-PR, page 2-77
VISM-PR-8T1	MGX-VISM-PR-8T1	Release 3.0.00	
VXSM-4-155	MGX-VXSM-155	Release 5.0.00	VXSM, page 2-80
VXSM-48-T1E1	MGX-VXSM-T1E1	Release 5.0.00	
VXSM-T3	MGX-VXSM-T3	Release 5.2	

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MGX 8850 (PXM1E) or MGX 8850/B (PXM1E) Card Overview

MGX 8850 (PXM1E) or MGX 8850/B (PXM1E) front cards and compatible back cards are listed in the Table 1-3.

Table 2-2 also lists the front cards supported in a MGX 8850 (PXM1E) or MGX 8850/B (PXM1E) switch, in addition to the MGX release when the front card support was introduced, and a section reference for more details.

Table 2-2 Release History of MGX 8850 (PXM1E) or MGX 8850/B (PXM1E) Switch Front Cards

Front Card		MGX Software Release When First Supported	Reference Section
Name Printed on the Faceplate	Cisco Product ID		
AUSM-8E1/B	MGX-AUSM-8E1/B	Release 3.0.0	AUSM, page 2-10
AUSM-8T1/B	MGX-AUSM-8T1/B	Release 3.0.0	
CESM-8E1	AX-CESM-8E1	Release 3.0.00	CESM, page 2-23
CESM-8T1/B	AX-CESM-8T1/B	Release 3.0.00	
FRSM-2CT3	MGX-FRSM-2CT3	Release 4.0.00	FRSM, page 2-27
FRSM-8E1	AX-FRSM-8E1	Release 3.0.00	
FRSM-8E1-C (the channelized version of the front card)	AX-FRSM-8E1-C	Release 3.0.00	
FRSM-8T1	AX-FRSM-8T1	Release 3.0.00	
FRSM-8T1-C (the channelized version of the front card)	AX-FRSM-8T1-C	Release 3.0.00	
FRSM-HS2/B	MGX-FRSM-HS2/B	Release 3.0.00	
MPSM-8-T1E1	MPSM-8-T1E1	Release 5.0.10	MPSM-8-T1E1, page 2-38
MPSM-T3E3-155	MPSM-T3E3-155	Release 5.0.10	MPSM-T3E3-155, page 2-39
MPSM-16-T1E1	MPSM-16-T1E1	Release 5.1	MPSM-16-T1E1, page 2-42
PXM1E-4-155	PXM1E-4-155	Release 3.0.00	PXM1E, page 2-45
PXM1E-8-155	PXM1E-8-155	Release 4.0.00	
PXM1E-8-T3E3	PXM1E-8-T3E3	Release 3.0.00	
PXM1E-16-T1E1	PXM1E-16-T1E1	Release 3.0.10	
PXM1E-COMBO	PXM1E-COMBO	Release 3.0.00	
RPM-PR-256	MGX-RPM-PR-256	Release 3.0.00	RPM-PR, page 2-62
RPM-PR-512	MGX-RPM-PR-512	Release 3.0.00	
SRM-3T3/C	SRM-3T3/C	Release 3.0.00	SRM, page 2-68
SRME	MGX-SRME	Release 3.0.00	
SRME/B	MGX-SRME/B	Release 5	

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Table 2-2 Release History of MGX 8850 (PXM1E) or MGX 8850/B (PXM1E) Switch Front Cards

Front Card		MGX Software Release When First Supported	Reference Section
Name Printed on the Faceplate	Cisco Product ID		
VISM-PR-8E1	MGX-VISM-PR-8E1	Release 3.0.00	VISM-PR, page 2-77
VISM-PR-8T1	MGX-VISM-PR-8T1	Release 3.0.00	

MGX 8950 Card Overview

MGX 8950 front cards and compatible back cards are listed in Table 1-3.

Table 2-3 lists the front cards supported in a MGX 8950 switch, in addition to the MGX release when the front card support was introduced, and a section reference for more details.

Table 2-3 Release History of MGX 8950 Switch Front Cards

Front Card		MGX Software Release When First Supported	Refer to this Section for More Details
Name Printed on the Faceplate	Cisco Product ID		
AXSM-1-2488/B	AXSM-1-2488/B	Release 2.1.76	AXSM, page 2-13
AXSM-1-9953-XG	AXSM-1-9953-XG	Release 4.0.00	
AXSM-4-622/B	AXSM-4-622/B	Release 2.1.76	
AXSM-4-2488-XG	AXSM-4-2488-XG	Release 4.0.00	
AXSM-8-622-XG	AXSM-8-622-XG	Release 5.2.00	
AXSM-16-155/B	AXSM-16-155/B	Release 2.1.76	
AXSM-16-155-XG	AXSM-16-155-XG	Release 5	
AXSM-16-T3E3/B	AXSM-16-T3E3/B	Release 2.1.76	
PXM45/B	PXM45/B	Release 2.1.76	PXM45, page 2-57
PXM45/C	PXM45/C	Release 4.0.00	
RPM-PR-256	MGX-RPM-PR-256	Release 2.1.76	RPM-PR, page 2-62
RPM-PR-512	MGX-RPM-PR-512	Release 2.1.76	
RPM-XF-512	MGX-RPM-XF-512	Release 3.0.10	RPM-XF, page 2-65
XM60	XM60	Release 2.1.76	XM60, page 2-89

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MGX 8830/B (PXM45/C) Card Overview

MGX 8830/B front cards and compatible back cards are listed in Table 1-3.

Table 2-4 lists the front cards supported in an MGX 8830/B (PXM45/C) switch, the MGX release when the front card support was introduced, and a section reference for more details.

Table 2-4 Release History of MGX 8830/B (PXM45/C) Switch Front Cards

Front Card		MGX Software Release When First Supported	Refer to this Section for More Details
Name Printed on the Faceplate	Cisco Product ID		
AXSM-8-622-XG	AXSM-8-622-XG	Release 5.2.00	AXSM, page 2-13
AXSM-16-155-XG	AXSM-16-155-XG	Release 5.0.00	
AXSM-2-622-E	AXSM-2-622-E	Release 2.1.60	
AXSM-16-T3E3	AXSM-16-T3E3	Release 2.0.01	
MPSM-8-T1E1	MPSM-8-T1E1	Release 5.0.10	MPSM-8-T1E1, page 2-38
MPSM-T3E3-155	MPSM-T3E3-155	Release 5.0.10	MPSM-T3E3-155, page 2-39
MPSM-16-T1E1	MPSM-16-T1E1	Release 5.1	MPSM-16-T1E1, page 2-42
PXM45/C	PXM45/C	Release 4.0.00	PXM45, page 2-57
RPM-PR-256	MGX-RPM-PR-256	Release 3.0.00	RPM-PR, page 2-62
RPM-PR-512	MGX-RPM-PR-512	Release 3.0.00	
RPM-XF-512	MGX-RPM-XF-512	Release 3.0.10	RPM-XF, page 2-65
SRME/B	MGX-SRME/B	Release 5	SRME, page 2-71
VISM-PR-8E1	MGX-VISM-PR-8E1	Release 3.0.10	VISM-PR, page 2-77
VISM-PR-8T1	MGX-VISM-PR-8T1	Release 3.0.10	

Note Although the illustrations in this chapter are displayed vertically, cards are installed horizontally in a MGX 8830 switch.

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MGX 8830 or MGX 8830/B (PXM1E) Card Overview

MGX 8830 or MGX 8830/B front cards and compatible back cards are listed in Table 1-3.

Table 2-5 lists the front cards supported in a MGX 8830 or MGX 8830/B (PXM1E) switch, the MGX release when the front card support was introduced, and a section reference for more details.

Table 2-5 Release History of MGX 8830 or MGX 8830/B Switch Front Cards

Front Card		MGX Software Release When First Supported	Refer to this Section for More Details
Name Printed on the Faceplate	Cisco Product ID		
AUSM-8E1/B	MGX-AUSM-8E1/B	Release 3.0.00	AUSM, page 2-10
AUSM-8T1/B	MGX-AUSM-8T1/B	Release 3.0.00	
CESM-8E1	AX-CESM-8E1	Release 3.0.00	CESM, page 2-23
CESM-8T1/B	AX-CESM-8T1/B	Release 3.0.00	
FRSM-2CT3	MGX-FRSM-2CT3	Release 4.0.00	FRSM, page 2-27
FRSM-2T3E3	MGX-FRSM-2T3E3	Release 4.0.00	
FRSM-8E1	AX-FRSM-8E1	Release 3.0.00	
FRSM-8E1-C (the channelized version of the front card)	AX-FRSM-8E1-C	Release 3.0.00	
FRSM-8T1	AX-FRSM-8T1	Release 3.0.00	
FRSM-8T1-C (the channelized version of the front card)	AX-FRSM-8T1-C	Release 3.0.00	
FRSM-HS2/B	MGX-FRSM-HS2/B	Release 3.0.00	
MPSM-8-T1E1	MPSM-8-T1E1	Release 5.0.10	MPSM-8-T1E1, page 2-38
MPSM-T3E3-155	MPSM-T3E3-155	Release 5.0.10	MPSM-T3E3-155, page 2-39
MPSM-16-T1E1	MPSM-16-T1E1	Release 5.1	MPSM-16-T1E1, page 2-42
PXM1E-4-155	PXM1E-4-155	Release 3.0.00	PXM1E, page 2-45
PXM1E-8-155	PXM1E-8-155	Release 4.0.00	
PXM1E-8-T3E3	PXM1E-8-T3E3	Release 3.0.00	
PXM1E-16-T1E1	PXM1E-16-T1E1	Release 3.0.10	
PXM1E-COMBO	PXM1E-COMBO	Release 3.0.00	
RPM-PR-256	MGX-RPM-PR-256	Release 3.0.00	RPM-PR, page 2-62
RPM-PR-512	MGX-RPM-PR-512	Release 3.0.00	
SRM-3T3/C	SRM-3T3/C	Release 3.0.00	SRME, page 2-71
SRME	MGX-SRME	Release 3.0.10	
SRME/B	MGX-SRME/B	Release 5	

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Table 2-5 Release History of MGX 8830 or MGX 8830/B Switch Front Cards (continued)

Front Card		MGX Software Release When First Supported	Refer to this Section for More Details
Name Printed on the Faceplate	Cisco Product ID		
VISM-PR-8E1	MGX-VISM-PR-8E1	Release 3.0.10	VISM-PR, page 2-77
VISM-PR-8T1	MGX-VISM-PR-8T1	Release 3.0.10	

Note Although the illustrations in this chapter are displayed vertically, cards are installed horizontally in a MGX 8830 switch.

MGX 8880 Card Overview

The MGX 8880 Media Gateway makes its debut with MGX Release 5 software. MGX 8880 front cards and compatible back cards are listed in Table 1-3 on page 1-7.

Table 2-6 also lists the front cards supported in a MGX 8880 Media Gateway and a section reference for more details.

Table 2-6 Release History of Front Cards for the MGX 8880 Media Gateway

Front Card		Introduced on MGX 8880 Gateway in MGX Software	Refer to this Section for More Details
Name Printed on the Faceplate	Cisco Product ID		
AXSM-1-2488/B	AXSM-1-2488/B	existed before MGX 8880	AXSM, page 2-13
AXSM-4-622/B	AXSM-4-622/B		
AXSM-16-155/B	AXSM-16-155/B		
AXSM-16-T3E3/B	AXSM-16-T3E3/B		
AXSM-32-T1E1-E	AXSM-32-T1E1-E		
PXM45/C	PXM45/C		PXM45, page 2-57
RPM-PR-512	MGX-RPM-PR-512		RPM-PR, page 2-62
RPM-XF-512	MGX-RPM-XF-512		RPM-XF, page 2-65
SRME/B	MGX-SRME/B	Release 5	SRME, page 2-71
VISM-PR-8E1	MGX-VISM-PR-8E1	existed before MGX 8880	VISM-PR, page 2-77
VISM-PR-8T1	MGX-VISM-PR-8T1		
VXSM-4-155	MGX-VXSM-155	Release 5	VXSM, page 2-80
VXSM-48-T1E1	MGX-VXSM-T1E1	Release 5	
VXSM-T3	MGX-VXSM-T3	Release 5.2	

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PXM45 and AXSM Support for Current and Previous Releases

Table 2-7 lists AXSM and PXM45 support for releases 3 through 5.1. For details, refer to the MGX manuals listed in the "Obtaining Documentation" section.

Note The MGX 8880 Media Gateway uses only the PXM45/C controller card.

Table 2-7 AXSM and PXM45 Support for Releases 3 through 5.1

Front Card	Release 3	Release 4	Release 5.1
PXM45	fully supported	supported with Release 3 features (except for the Preferred Routes feature)	not supported
PXM45/B	fully supported	fully supported	fully supported
PXM45/C	not applicable	fully supported	fully supported
AXSM	fully supported	fully supported if used in conjunction with PXM45/B or PXM45/C	fully supported if used in conjunction with PXM45/B or PXM45/C
AXSM/B	fully supported	fully supported if used in conjunction with PXM45/B or PXM45/C	fully supported if used in conjunction with PXM45/B or PXM45/C
AXSM/E	fully supported	fully supported if used in conjunction with PXM45/B or PXM45/C	fully supported if used in conjunction with PXM45/B or PXM45/C

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Front Cards

AUSM

Supported models: MGX 8830, MGX 8830/B, MGX 8850 (PXM1E), MGX 8850 (PXM1E)

AUSM cards are service modules that provide ATM Network-to-Network Interfaces (NNIs)/UNIs that operate at T1 or E1 rates so that ATM UNI user devices can transmit and receive traffic.

Consistent with the Cisco intelligent quality of service (QoS) management features, AUSM cards support per-virtual circuit (VC) queuing on ingress and multiple class-of-service queues on egress. AUSM/Bs fully support continuous bit rate (CBR), variable bit rate (VBR), unspecified bit rate (UBR), and available bit rate (ABR) service classes.

When the AUSM is combined with a back card, a card set is created. Table 2-8 provides information about each AUSM, interface, and corresponding back card.

Table 2-8 AUSM Cards, Interfaces, and Supported Back Cards

AUSM	Interface Connections	# of Lines Supported	Types of Lines Supported	Supported Back Cards
AUSM-8E1/B	NNI/UNI	Up to 8	E1 (up to 2.048 Mbps +/–50 bps)	• MGX-RJ48-8E1 (for use in Australia) • RJ48-8E1 • R-RJ48-8E1 • SMB-8E1 • R-SMB-8E1
AUSM-8T1/B	NNI/UNI	Up to 8	T1 (up to 1.544 Mbps +/–50 bps)	• RJ48-8T1 • R-RJ48-8T1

The AUSM cards also support ATM Forum-compliant inverse multiplexing over ATM (IMA) 1.0. This capability enables multiple T1 or E1 lines to be grouped into a single high-speed ATM port. This n x T1 and n x E1 capability fills the gap between T1/E1 and T3/E3, providing bandwidth up to 12 Mbps (n x T1) or 16 Mbps (n x E1), without requiring a T3/E3 circuit.

Note For information on AUSM software features and configurations, refer to the *Cisco ATM Services (AUSM/MPSM-8-T1E1) Configuration Guide and Command Reference for MGX Switches, Release 5.2*. For technical specifications for the AUSM cards, see the "Single-Height Service Module Specifications" section on page A-2.

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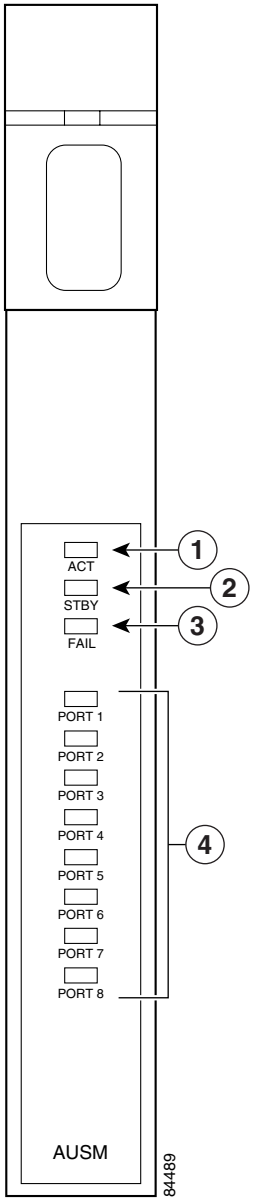
Faceplate Features

Figure 2-1 shows an AUSM faceplate.

Figure 2-1 AUSM Faceplate



1	ACT—Active LED	**3**	FAIL LED
2	STBY—Standby LED	**4**	PORT 1 through PORT 8 LEDs

Note The only visible difference between the AUSM-8E1/B and AUSM-8T1/B faceplates is the product name, which is silk-screened on the front of each faceplate.

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Table 2-9 describes the LEDs on the AUSM cards.

Table 2-9 AUSM LEDs

LED	Status	Description
ACT	Green	The AUSM card set (front card and back card) is in active state.
STBY	Yellow or blinking yellow	One of the following conditions exists: • The AUSM is in Standby mode. • The AUSM is in mismatch state. • The AUSM digital signal processors (DSPs) are currently involved in the AUSM bootup process.
FAIL	Red	When this LED is solid red and the ACT and STBY LEDs are off, one of the following conditions exists: • The module is in Reset mode. • The module has failed. • The card set is not complete (no back card).
PORT 1 through PORT 8	Green	The port is active with no alarms detected.
	Red	The port is active and a local alarm has been detected.
	Yellow	The port is active and a remote alarm has been detected.
	Off	The port is not configured, or the card set is configured as a redundant card set and is in Standby mode.

Module Configurations

The AUSM supports the following module configurations:

- Standalone.
- 1:N card set redundancy, without bulk distribution.
- 1:N card set redundancy, with bulk distribution—For line redundancy to be supported in this configuration, there must be redundant PXM1Es and redundant SRME cards. The APS connector must be installed between the SRME cards.
- Bulk distribution.
- IMA (ATM Forum 1.0-compliant only).

Note For module configuration information, see Chapter 4, “Planning for Card Redundancy, Line Redundancy, and Bulk Distribution”.

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AXSM

Supported models: MGX 8850 (PXM45), MGX 8850/B (PXM45), MGX 8950, MGX 8880

The ATM switching service modules (AXSMs) provide either ATM network-to-network interfaces (NNIs) or ATM user-to-network interfaces (UNIs). The AXSM cards have serial link connections to the PXM45, providing a data rate of up to 2.488 Gbps per AXSM. Table 1-3 provides compatibility information for AXSM cards.

Table 2-10 lists interface and backcard information for each AXSM card.

Table 2-10 AXSM Cards, Interfaces, and Supported Back Cards

AXSM	Interface Connections	Number of Lines Supported	Types of Lines Supported	APS	Supported Back Cards
AXSM-1-2488	NNI	1	OC-48c or STM-16 line at 2488 Mbps	Yes	• SMFLR-1-2488 • SMFSR-1-2488 • SMFXLR-1-2488
AXSM-1-2488/B	NNI	1	OC-48c or STM-16 line at 2488 Mbps	Yes	• SMFLR-1-2488/B • SMFSR-1-2488/B • SMFXLR-1-2488/B
AXSM-1-9953-XG		1	OC-192c or STM-64 With these back cards, this card can work at the OC192 rate providing one OC-192 port/trunk.	Yes	• SMFSR-1-9953 • SMFIR-1-9953 • SMFLR-1-9953
AXSM-2-622-E	NNI or UNI	2	OC-12c or STM-4 lines at 622 Mbps	Yes	• SMFIR-1-622/C • SMFLR-1-622/C
AXSM-4-622	NNI or UNI	4	OC-12c or STM-4 lines at 622 Mbps	Yes	• SMFIR-2-622 • SMFLR-2-622
AXSM-4-622/B	NNI or UNI	4	OC-12c or STM-4 lines at 622 Mbps	Yes	• SMFIR-2-622/B • SMFLR-2-622/B
AXSM-8-622-XG[1]	NNI or UNI	8	OC-12c or STM-4 lines at 622 Mbps	Yes	• SFP-4-622
AXSM-4-2488-XG		4	Quad OC-48 or STM-16 clear channel. When used in the channelized mode, can carry up to 64 DS3 channels, 64 OC-3 or STM-1 channels, 16 OC-12 or STM-4 channels, or any combination of these three types adding up to 64 channels.	Yes	
AXSM-8-155-E	NNI or UNI	8	OC-3c or STM-1 lines at 155 Mbps	Yes	• MMF-4-155/C • SMB-4-155 • SMFIR-4-155/C • SMFLR-4-155/C

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Table 2-10 AXSM Cards, Interfaces, and Supported Back Cards (continued)

AXSM	Interface Connections	Number of Lines Supported	Types of Lines Supported	APS	Supported Back Cards
AXSM-16-155	NNI or UNI	16	OC-3c or STM-1 lines at 155 Mbps	Yes	• MMF-8-155-MT • SMFIR-8-155-LC • SMFLR-8-155-LC
AXSM-16-155/B	NNI or UNI	16	OC-3c or STM-1 lines at 155 Mbps	Yes	• MMF-8-155-MT/B • SMB-4-155 • SMFIR-8-155-LC/B • SMFLR-8-155-LC/B
AXSM-16-155-XG[1]	NNI or UNI	16	OC-3 with VSVD	No	• MCC-8-155 • SFP-8-155 Transceivers for the SFP-8-155 back card: – MF-1-155-SFP – SMFIR-1-155-SFP – SMFLR-1-155-SFP
AXSM-16-T3E3	NNI or UNI	16	T3 or E3 lines	No	• SMB-8E3 • SMB-8T3
AXSM-16-T3E3/B	NNI or UNI	16	T3 or E3 lines	No	• SMB-8E3 • SMB-8T3
AXSM-16-T3E3-E	NNI or UNI	16	T3 or E3 lines	No	• SMB-8E3 • SMB-8T3
AXSM-32-T1E1-E	NNI or UNI	32	T1 or E1 lines **Note** The default mode is T1.	No	• MCC-16-E1 • RBBN-16-T1E1

1. MGX8950-EXTDR-CON is required for AXSM-16-155-XG and AXSM-8-622-XG cards in the Cisco MGX 8950 chassis.

Some AXSM port speeds are available in up to three different models (for example, an AXSM-16-155, an AXSM-16-155/B, and an AXSM-16-155-E). Keep the following guidelines in mind:

- The model number without the alpha suffix is the older model. For example, the AXSM-16-155 is the older model. Both the AXSM-16-155/B and AXSM-16-155-E are newer models. The AXSM-16-155 can be replaced by an AXSM-16-155/B. If you replace an AXSM-16-155 or AXSM16-155/B with an AXSM-16-155-E, the slot needs to be reconfigured.
- When you replace an AXSM model, be sure to replace it with a model that has the same port density. If the AXSM models have different port densities, you must use CLI commands to make special preparations prior to installation.
- A combination of models can be used in the same switch, but different models cannot be used together in an APS configuration.

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- When you replace an AXSM model that is in an APS configuration, be sure to replace it only with the same model. If APS is not configured, a different model can be used as a replacement, but a supported back card must also be installed. See Table 1-3 for AXSM and back card compatibility.

For information on the AXSM software features and configurations, refer to the *Cisco ATM Services (AXSM) Configuration Guide and Command Reference for MGX Switches, Release 5.2.* For technical specifications for the AXSM cards, see the "Double-Height Service Module Specifications" section on page A-2.

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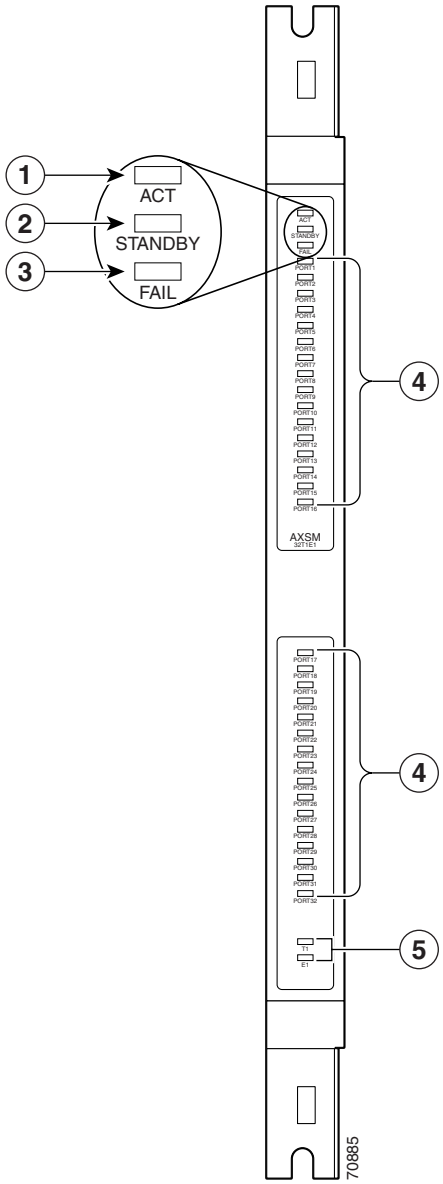
Faceplate Features

Figure 2-2 shows an example of an AXSM faceplate.

Figure 2-2 AXSM Faceplate Example



1	ACT—Active LED	**4**	PORT *x* LEDs **Note** The number of ports varies with the AXSM type installed.
2	STANDBY LED	**5**	E1 or T1 LEDs **Note** See Table 2-11 for details about the LED support.
3	FAIL LED		

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Note You can identify the AXSM by the product name silk-screened on the faceplate. See Table 1-3 for a list of the AXSM cards available for each chassis.

Figure 2-3 through Figure 2-5 show examples of AXSM-XG faceplates.

The AXSM-16-155-XG card (Figure 2-5) was introduced in Release 5. The AXSM-16-155-XG is a 16-port ATM Service Module. Like the AXSM-16-155/B, it supports full simultaneous OC-3 bandwidth at all 16 ports. Like the AXSM-8-155-E, it supports ABR traffic with VS/VD. Thus the AXSM-16-155-XG is an OC-3 version of the AXSM-4-2488-XG.

Note that the extender card (Figure 1-23) was also released in Release 5, to support the AXSM-16-155-XG. The extender card is needed because it helps the AXSM-16-155-XG support Very High Density Metric (VHDM).

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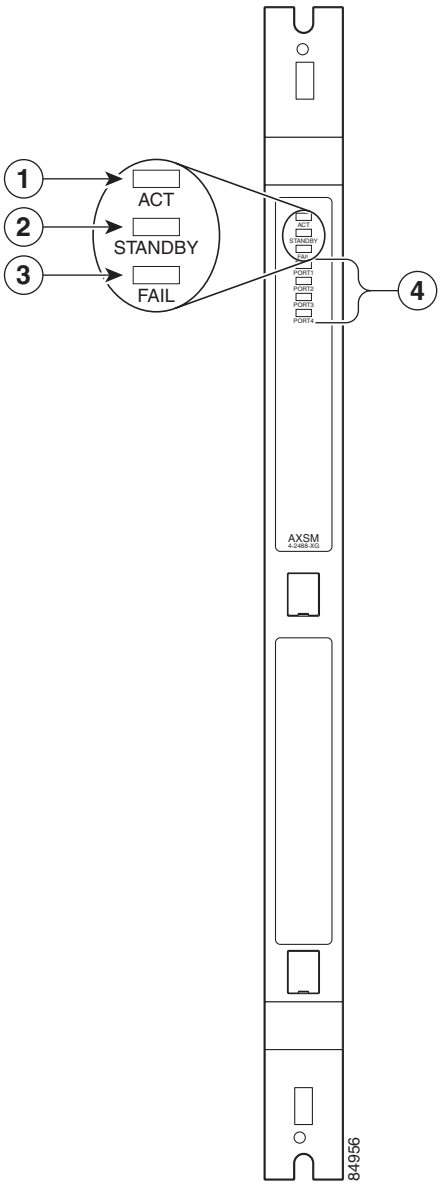
Figure 2-3 AXSM-XG Faceplate Example (AXSM-4-2488-XG)



1	ACT—Active LED	**3**	FAIL LED
2	STANDBY LED	**4**	PORT *x* LEDs **Note** The number of ports varies with the AXSM-XG type installed.

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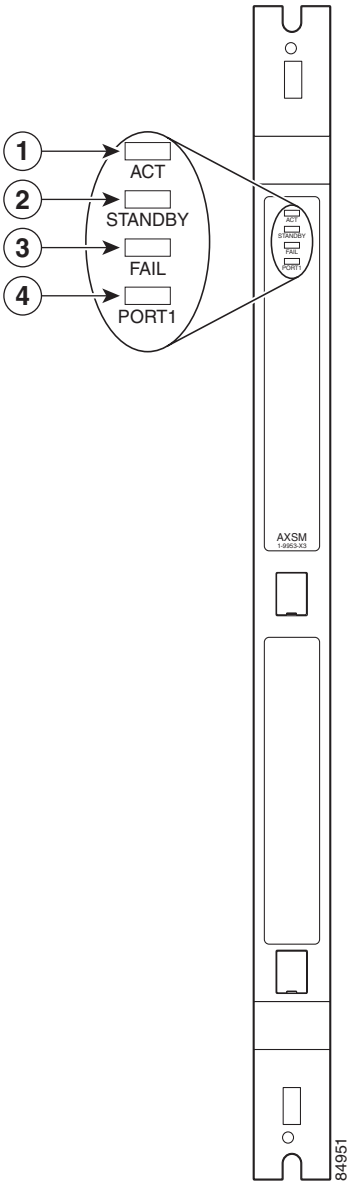
Figure 2-4 AXSM-XG Faceplate Example (AXSM-1-9953-XG)



1	ACT—Active LED	**3**	FAIL LED
2	STANDBY LED	**4**	PORT *x* LEDs **Note** The number of ports varies with the AXSM-XG type installed.

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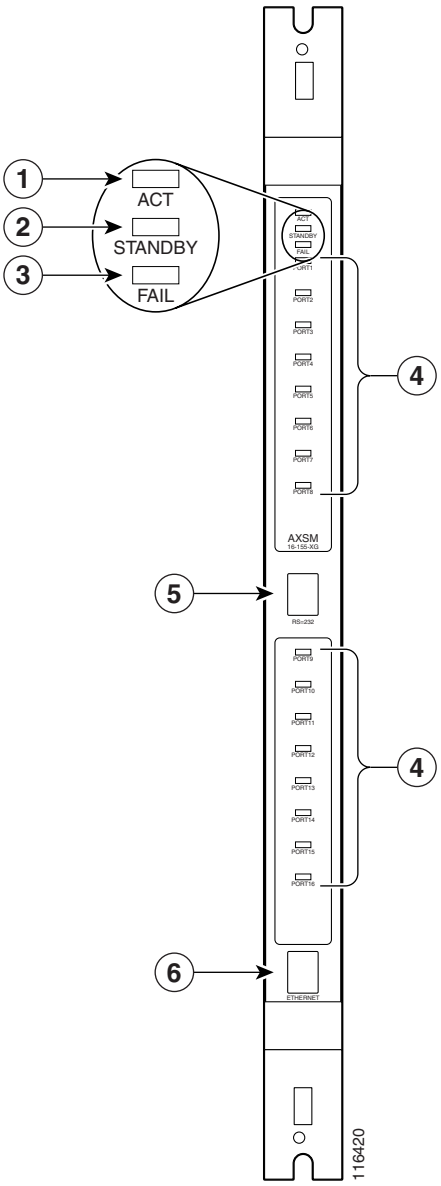
Figure 2-5 AXSM-XG Faceplate Example (AXSM-16-155-XG)



1	ACT—Active LED	**4**	PORT *x* LEDs
2	STANDBY LED	**5**	RS-232 Port
3	FAIL LED	**6**	Ethernet Port

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Table 2-11 describes the LEDs on the AXSM and AXSM-XG cards.

Table 2-11 AXSM and AXSM-XG LEDs

LED	Status	Description
ACT	Green	The AXSM card set (front card and back card) is in active state.
STANDBY	Yellow	The AXSM is in Standby mode.
FAIL	Red	A failure has been detected on the AXSM.
PORT *x* **Note** The number of ports varies with the type of AXSM installed in your system.	Green	The port is active with no alarms detected.
	Red	The port is active and a local alarm has been detected.
	Yellow	The port is active and a remote alarm has been detected.
	Off	The port is not configured.
E1 or T1 **Note** On AXSM-32-T1E1-E only.	Green	The AXSM card set is operating in E1 or T1 mode, depending on which LED is green.

Module Configurations

The AXSM supports the following module configurations:

- Standalone.
- Card set redundancy (Y-cable)—T1, T3, E1, E3, OC-3c and higher speed optical interfaces.
- 1:1 APS line redundancy (intracard)—OC-3c and higher speed optical interfaces.

Note The AXSM-1-2488 and AXSM-1-2488/B have only one port on the back card and cannot use intracard APS line redundancy.

- 1+1 card and APS line redundancy (intercard)—OC-3c and higher speed optical interfaces.
- IMA—AXSM-32-T1E1-E only.

Note For additional module configuration information, refer to Chapter 4, "Planning for Card Redundancy, Line Redundancy, and Bulk Distribution".

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Figure 2-6 shows how redundant AXSM cards connect to standalone lines.

Figure 2-6 Card Set Redundancy Configuration—AXSM Cards

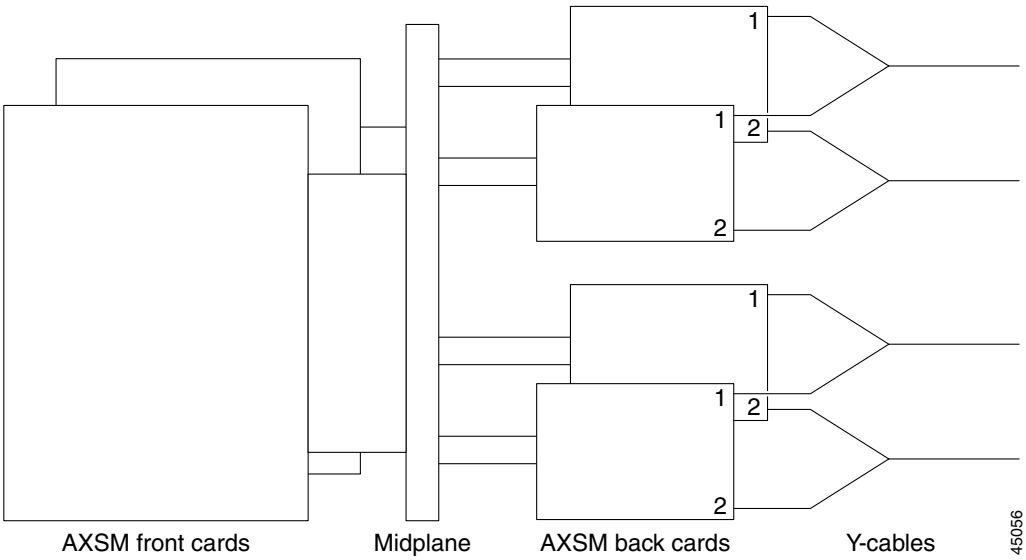
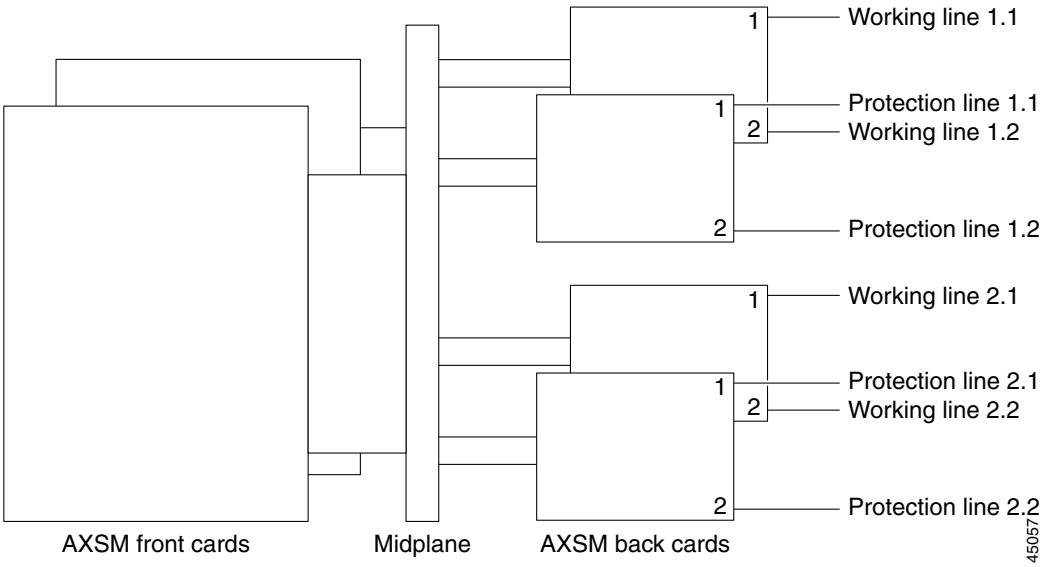


Figure 2-7 shows how redundant AXSM cards connect to redundant APS lines.

Figure 2-7 1+1 Card and APS Line Redundancy Configuration—AXSM Cards



Note In Figure 2-7, the AXSM back card pairs are installed in an APS connector.

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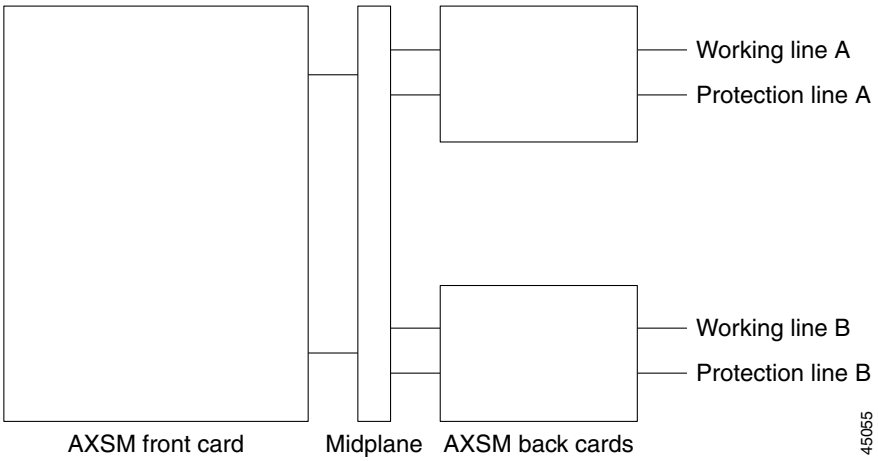
Figure 2-8 shows how a single AXSM connects to redundant APS lines.

Figure 2-8 1:1 APS Line Redundancy Configuration—AXSM Cards



CESM

Supported models: MGX 8850 (PXM1E/PXM45), MGX 8850/B (PXM1E/PXM45), MGX 8830, MGX 8830/B

CESM cards are service modules that provide a CBR circuit emulation service by converting data streams into CBR AAL1 cells for transport across an ATM network. The CESM supports the CES-IS specifications of the ATM Forum.

The CESM cards allow individual physical ports to be configured for structured (channelized) or unstructured (unchannelized) data transfer. The CESM allows circuit-based equipment, such as PBXs, to be interconnected over an ATM backbone via CBR connections. The eight-port CESM cards support both channelized (n x 64 kbps) and unchannelized (T1/E1) circuit-based equipment.

Synchronous clocking and asynchronous clocking, using either synchronous residual time stamp (SRTS) or adaptive clock recovery, are both supported.

Dynamic bandwidth allocation is supported through on-hook/off-hook detection that relinquishes backbone bandwidth when it is not required by the applications. This allows other traffic streams, such as VBR and ABR traffic, to take advantage of the bandwidth normally reserved for the circuit traffic.

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When the CESM is combined with a back card, a card set is created. Table 2-12 provides information about each CESM, interface, and corresponding back card.

Table 2-12 CESM Cards, Interfaces, and Supported Back Cards

CESM	Interface Connections	Number of Lines Supported	Types of Lines Supported	Supported Back Cards
CESM-8E1	Line or trunk	Up to 8	E1 (up to 2.048 Mbps)	• MGX-RJ48-8E1 (for use in Australia) • RJ48-8E1 • R-RJ48-8E1 (for use in Australia) • SMB-8E1 • R-SMB-8E1
CESM-8T1 and CESM-8T1/B	Line or trunk	Up to 8	T1 (up to 1.544 Mbps)	• RJ48-8T1 • R-RJ48-8T1

Note For information on CESM software features and configurations, refer to the *Cisco Circuit Emulation Services (CESM/MPSM-8-T1E1) Configuration Guide and Command Reference for MGX Switches, Release 5.2*. For technical specifications for the CESM cards, see the "Single-Height Service Module Specifications" section on page A-2.

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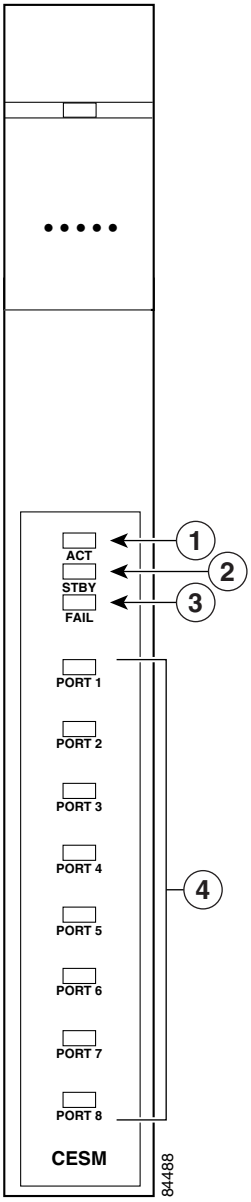
Faceplate Features

Figure 2-9 shows a CESM faceplate.

Figure 2-9 CESM Faceplate



1	ACT—Active LED	**3**	FAIL LED
2	STBY—Standby LED	**4**	PORT 1 through PORT 8 LEDs

Note The only visible difference between the CESM-8E1, CESM-8T1, and CESM-8T1/B faceplates is the product name silk-screened on the faceplate.

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Table 2-13 describes the LEDs on the CESM cards.

Table 2-13 CESM LEDs

LED	Status	Description
ACT	Green	The CESM card set (front card and back card) is in active state.
STBY	Yellow or blinking yellow	One of the following conditions exists: • The CESM is in Standby mode. • The CESM is in mismatch state. • The CESM DSPs are currently involved in the CESM bootup process.
FAIL	Red	When this LED is solid red and the ACT and STBY LEDs are off, one of the following conditions exists: • The module is in Reset mode. • The module has failed. • The card set is not complete (no back card).
PORT 1 through PORT 8	Green	The port is active with no alarms detected.
	Red	The port is active and a local alarm has been detected.
	Yellow	The port is active and a remote alarm has been detected.
	Off	The port is not configured, or the card set is configured as a redundant card set and is in Standby mode.

Module Configurations

The CESM supports the following module configurations:

- Standalone.
- 1:N card set redundancy, without bulk distribution.
- 1:N card set redundancy, with bulk distribution—For line redundancy to be supported in this configuration, there must be redundant PXM1E or PXM45 cards and redundant SRME cards. The APS connector must be installed between the SRME cards.
- Bulk distribution.

Note For module configuration information, refer to Chapter 4, "Planning for Card Redundancy, Line Redundancy, and Bulk Distribution".

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FRSM

Supported models: MGX 8850 (PXM1E/PXM45), MGX 8850/B (PXM1E/PXM45), MGX 8830, MGX 8830/B

The Frame Relay service module (FRSM) enables Frame Relay communications over an ATM network. The FRSM cards typically connect to a Frame Relay router. Communications from the Frame Relay router are then connected through the ATM network by a soft permanent virtual circuit (SPVC) to a remote device.

The FRSM-2CT3 allows full n x DS0 and DS1 channelization of T3s, for a maximum of 4000 virtual connections per module. The FRSM-2CT3 supports 256 ports per module. The FRSM-8E1-C allows full DS0 and n x DS0 channelization of the E1s, for a maximum of 248 ports per module. The FRSM-8T1-C allows full DS0 and n x DS0 channelization of the T1s, for a maximum of 192 ports per module. FRSM-8 supports 1000 VCs per module.

When the FRSM is combined with a back card, a card set is created. Table 2-14 provides information about each FRSM, interface, and corresponding back card.

Table 2-14 FRSM Cards, Interfaces, and Supported Back Cards

FRSM	Interface Connections	Number of Lines Supported	Types of Lines Supported	Maximum Ports per Module	Maximum VCs per Module	Supported Back Cards
FRSM-2CT3	NNI/UNI	Up to 2	Channelized T3 (up to 44.736 Mbps ±20 ppm)	256	4000	BNC-2T3
FRSM-2T3E3	NNI/UNI	Up to 2	E3 (up to 34.368 Mbps ±20 ppm) and T3 (up to 44.736 Mbps ±20 ppm)	2	2000	BNC-2E3 BNC-2T3 BNC-2E3A
FRSM-8E1	NNI/UNI	Up to 8	E1 (up to 2.048 Mbps ±50 bps or 32 ppm)	8	1000	MGX-RJ48-8E1 (for use in Australia) RJ48-8E1 R-RJ48-8E1 SMB-8E1 R-SMB-8E1
FRSM-8T1	NNI/UNI	Up to 8	T1 (up to 1.544 Mbps ±50 bps or 32 ppm)	8	1000	RJ48-8T1 R-RJ48-8T1
FRSM-8E1-C	NNI/UNI	Up to 8	Channelized E1 (up to 2.048 Mbps ±50 bps or 32 ppm)	248	1000	MGX-RJ48-8E1 (for use in Australia) RJ48-8E1 R-RJ48-8E1 SMB-8E1 R-SMB-8E1

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Table 2-14 FRSM Cards, Interfaces, and Supported Back Cards (continued)

FRSM	Interface Connections	Number of Lines Supported	Types of Lines Supported	Maximum Ports per Module	Maximum VCs per Module	Supported Back Cards
FRSM-8T1-C	NNI/UNI	Up to 8	Channelized T1 (up to 1.544 Mbps ±50 bps or 32 ppm)	192	1000	RJ48-8T1 R-RJ48-8T1
FRSM-HS2/B	NNI/UNI	Up to 2 Each port can operate in DTE or DCE mode.	High speed serial interface (HSSI), V.35, and X.21 Up to 2xHSSI ports, up to 8xV.35 ports, or up to 8xX.21 ports	8 (with 12IN1-8S) 2 (with MGX-SCSI2-2HSSI/B)	4000 (with 12IN1-8S) 2000 (with MGX-SCSI2-2HSSI/B)	12IN1-8S MGX-SCSI2-2HSSI/B
FRSM-12-T3E3	NNI/UNI	Up to 12	T3	12	16,000	SMB-6-T3E3
MPSM-8T1-FRM	NNI/UNI		T1	192	1000	RJ48-8T1 R-RJ48-8T1
MPSM-8E1-FRM	NNI/UNI	Up to 8	E1 (up to 2.048 Mbps ±50 bps or 32 ppm)	248	1000	MGX-RJ48-8E1 RJ48-8E1 SMB-8E1 R-RJ48-8E1 R-SMB-8E1
MPSM-T3E3-155	NNI/UNI	1 line	OC3 STM1	1000	4000	SFP-2-155 (for OC3/STM1) SMB-2-155-EL (for STM1)
		Up to 3	T3 E3			BNC-3-T3E3
MPSM-16-T1E1	NNI/UNI	Up to 16	T1 E1	496	2000	RBBN-16-T1E1 RBBN-16-T1E1-1N RED-16-T1E1 MCC-16-T1E1 MCC-16-E1-1N

Note For information on FRSM and FRSM-HS2/B software features and configurations, refer to the *Cisco Frame Relay Services (FRSM/MPSM-8-T1E1) Configuration Guide and Command Reference for MGX Switches, Release 5.2*.

For technical specifications for the FRSM cards, see the "Single-Height Service Module Specifications" section on page A-2. For information about Frame Relay cabling, see the "Frame Relay Cabling" section on page B-17.

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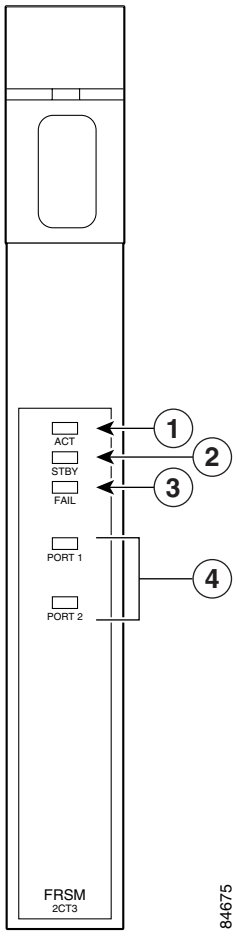
Faceplate Features

Figure 2-10 shows a FRSM-2CT3 faceplate.

Figure 2-10 FRSM-2CT3 Faceplate



1	ACT—Active LED	**3**	FAIL LED
2	STBY—Standby LED	**4**	PORT 1 through PORT 2 LEDs

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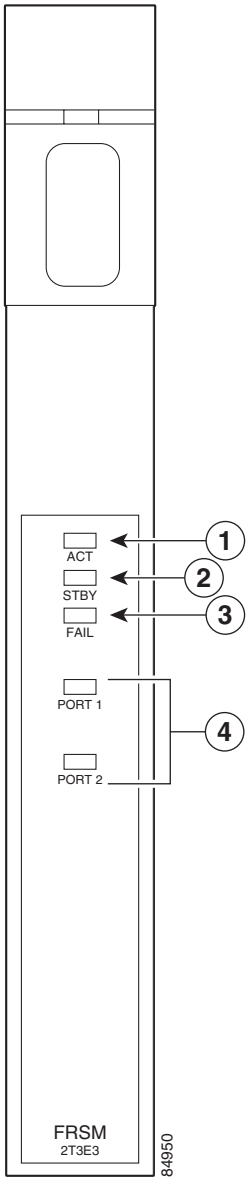
Figure 2-11 shows a FRSM-2T3E3 faceplate.

Figure 2-11 FRSM-2T3E3 Faceplate



1	ACT—Active LED	**3**	FAIL LED
2	STBY—Standby LED	**4**	PORT 1 through PORT 2 LEDs

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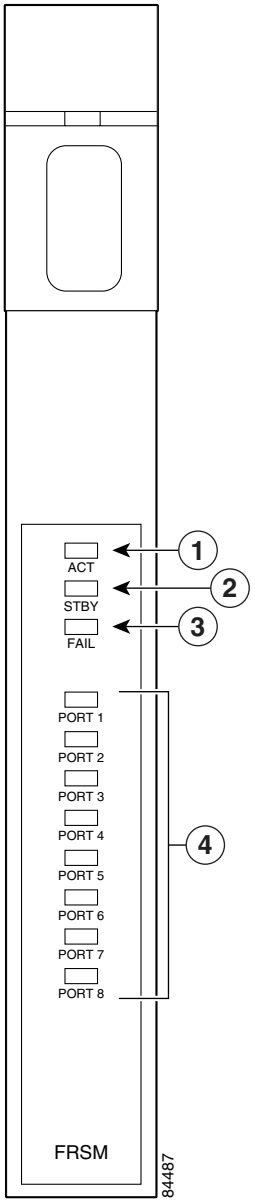
Figure 2-12 shows a faceplate typical of the FRSM-8E1, FRSM-8T1, FRSM-8E1-C, or FRSM-8T1-C front cards.

Figure 2-12 FRSM-8E1, FRSM-8T1, FRSM-8E1-C, and FRSM-8T1-C Faceplate



1	ACT—Active LED	**3**	FAIL LED
2	STBY—Standby LED	**4**	PORT 1 through PORT 8 LEDs

Note The only visible difference between the FRSM-8E1, FRSM-8T1, FRSM-8E1-C, and FRSM-8T1-C faceplates is the product name silk-screened on each faceplate.

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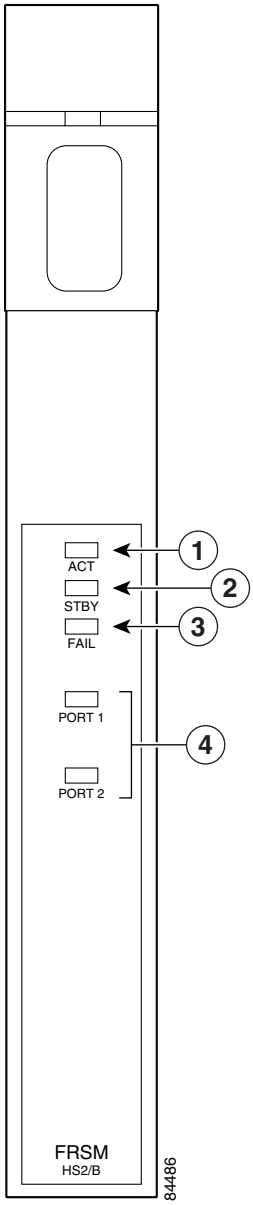
Figure 2-13 shows a FRSM-HS2/B faceplate.

Figure 2-13 FRSM-HS2/B Faceplate



1	ACT—Active LED	**3**	FAIL LED
2	STBY—Standby LED	**4**	PORT 1 and PORT 2 LEDs

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Table 2-15 describes the LEDs on the FRSM cards.

Table 2-15 FRSM LEDs

LED	Status	Description
ACT	Green	The FRSM card set (front card and back card) is in active state.
STBY	Yellow or blinking yellow	One of the following conditions exists: • The FRSM is in Standby mode. • The FRSM is in mismatch state. • The FRSM DSPs are currently involved in the FRSM bootup process.
FAIL	Red	When this LED is solid red and the ACT and STBY LEDs are off, one of the following conditions exists: • The module is in Reset mode. • The module has failed. • The card set is not complete (no back card).
PORT *x* **Note** The number of ports varies with the type of FRSM installed in your system.	Green	The port is active with no alarms detected.
	Red	The port is active and a local alarm has been detected.
	Yellow	The port is active and a remote alarm has been detected.
	Off	The port is not configured, or the card set is configured as a redundant card set and is in Standby mode.

Module Configurations

The FRSM-2CT3 and FRSM-2T3E3 support the following module configurations:

- Standalone.
- Card set redundancy (Y-cable)—T1, T3, E1, E3, OC-3c and higher speed optical interfaces.

The FRSM-8E1, FRSM-8E1-C, FRSM-8T1, and FRSM-8T1-C supports the following module configurations:

- Standalone.
- 1:N card set redundancy, without bulk distribution.
- 1:N card set redundancy, with bulk distribution—For line redundancy to be supported in this configuration, there must be redundant PXM1Es and redundant SRMEs. The APS connector must be installed between the SRMEs.
- Bulk distribution.

Note If the FRSM-8E1-C or FRSM-8T1-C have ForeSight/ABR enabled, they can be used as a standby service module for the FRSM-8E1 or FRSM-8T1 (with or without ForeSight/ABR enabled).

For module configuration information, refer to Chapter 4, "Planning for Card Redundancy, Line Redundancy, and Bulk Distribution".

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FRSM-12-T3E3

Supported models: MGX 8850 (PXM45), MGX 8850/B (PXM45)

The FRSM-12-T3E3 is a high-density, double-height service module that enables Frame Relay communications over an ATM network. It provides 12 ports of unchannelized T3 Frame Relay with 622 Mbps of ATM throughput.

Note As of MGX Release 4, T3 support is operational and E3 is planned for a future release.

The FRSM-12-T3E3 typically connects to a Frame Relay router. Communications through the ATM network are accomplished by means of SPVCs set up between the originating device and a remote destination device.

When the FRSM-12-T3E3 is combined with a back card, a card set is created. Table 2-16 provides information about the FRSM-12-T3E3, interface, and corresponding back card.

Table 2-16 FRSM-12-T3E3, Interfaces, and Supported Back Cards

FRSM12	Interface Connections	Number of Lines Supported	Types of Lines Supported	Supported Back Card
FRSM-12-T3E3	NNI/UNI	Up to 12	T3/E3 Frame Relay	• SMB-6-T3E3

Note For technical specifications for the FRSM12s, see the "Double-Height Service Module Specifications" section on page A-2.

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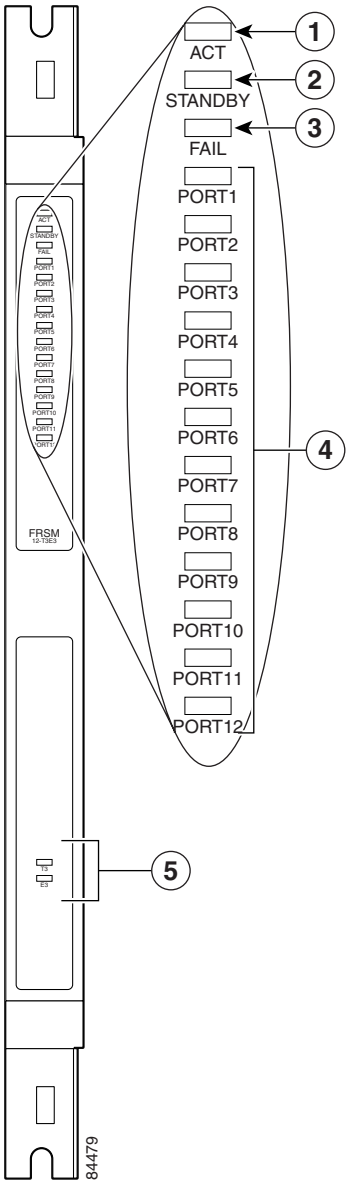
Faceplate Features

Figure 2-14 shows a FRSM-12-T3E3 faceplate.

Figure 2-14 FRSM-12-T3E3 Faceplate



1	ACT—Active LED	**4**	PORT 1 through PORT 12 LEDs
2	STANDBY LED	**5**	T3 and E3 LEDs
3	FAIL LED		

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Table 2-17 describes the LEDs on the FRSM-12-T3E3s.

Table 2-17 FRSM-12-T3E3 LEDs

LED	Status	Description
ACT	Green	The FRSM-12-T3E3 card set (front card and back card) is in active state.
STANDBY	Yellow	The FRSM-12-T3E3 is in Standby mode.
FAIL	Red	A failure has been detected on the FRSM-12-T3E3.
PORT 1 through PORT 12	Green	The port is active with no alarms detected.
	Red	The port is active and a local alarm has been detected.
	Yellow	The port is active and a remote alarm has been detected.
	Off	The port is not configured.
T3 or E3	Green	The FRSM-12-T3E3 card set is operating in either T3 or E3 mode (depending on which LED is green).

Note For information on FRSM-12-T3E3 software features and configurations, refer to the *Frame Relay Software Configuration Guide and Command Reference for the Cisco MGX 8850 FRSM12 Card, Release 3*.

Module Configurations

The FRSM-12-T3E3 card supports the following module configurations:

- Standalone.
- Card set redundancy (Y-cable)—T3 and E3 interfaces.

Note As of MGX Release 4, T3 support is operational and E3 is planned for a future release. For module configuration information, refer to Chapter 4, "Planning for Card Redundancy, Line Redundancy, and Bulk Distribution".

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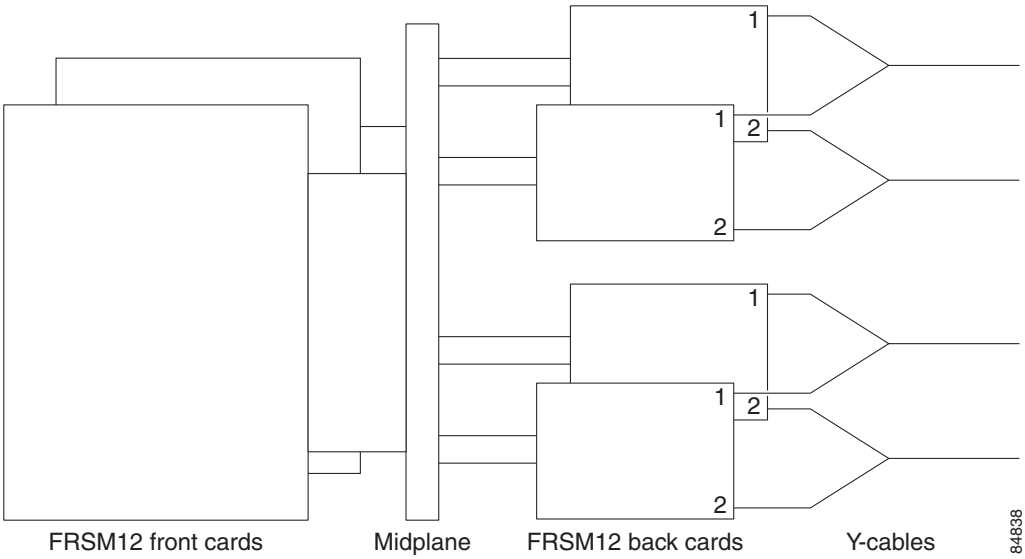
Figure 2-15 shows how redundant FRSM-12-T3E3 cards connect to standalone lines.

Figure 2-15 Card Set Redundancy Configuration—FRSM-12-T3E3 Cards



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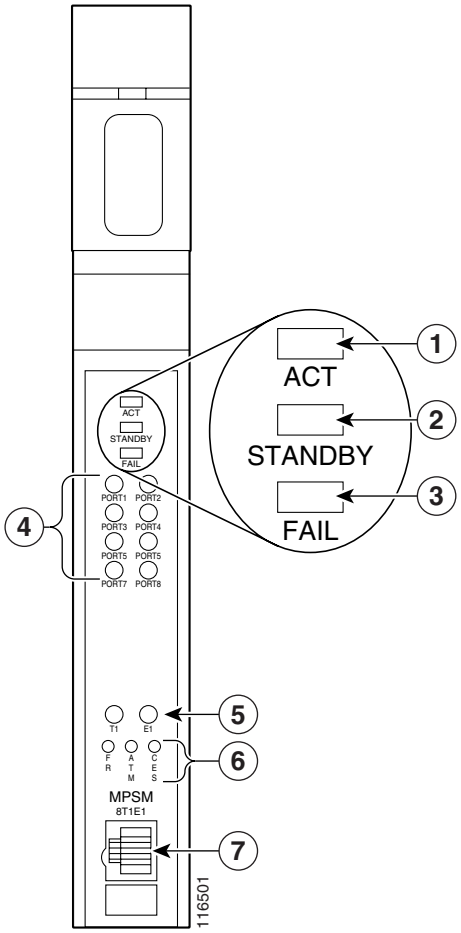
MPSM-8-T1E1

Supported models: MGX 8850 (PXM1E/PXM45), MGX 8850/B (PXM1E/PXM45), MGX 8830, MGX 8830/B

The MPSM-8-T1E1 (Multiprotocol Service Module) is a single-height replacement card for the AUSM-8T1/E1, FRSM-8T1/E1, and CESM-8T1/E1 narrowband service modules, and supports the back cards each of those service modules supports. The MPSM-8-T1E1 card has *any service, any card* (ASAC) capability. Figure 2-16 shows the MPSM-8-T1E1 faceplate.

Figure 2-16 MPSM-8-T1E1 Faceplate



1	Active LED (ACT)	**5**	T1 or E1 Mode
2	Standby LED (STBY)	**6**	Service LED (ATM, FR, Circuit Emulation)
3	FAIL LED	**7**	Console Port
4	PORT1 through PORT 8		

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MPSM-T3E3-155

Supported models: MGX 8850 (PXM1E/PXM45), MGX 8850/B (PXM1E/PXM45), MGX 8830, MGX 8830/B

The MPSM-T3E3-155 (Multi-Protocol Service Module) is a single-height multiprotocol service module. This card is a cell-bus based service module with OC-3 capacity. The card implements multiple protocols (ATM, including IMA, and Frame Relay) on the same board, achieved by performing most of the data processing in software. Thus it provides *any service, any port* (ASAP) support, and can support broadband and narrowband ports simultaneously.

Designed as a replacement for the existing AXSM and FRSM12 service modules (FRSM-2T3E3and FRSM-2CT3 front cards), the MPSM-T3E3-155 card is an Any Service Any Port (ASAP) service module that supports multiple interface types (OC3, T3 and E3, and channelized T1, E1, VTs, and DS0s) and two service types (ATM and Frame Relay).

Table 2-18 lists the different MPSM-T3E3-155 back card types, along with the number of lines, number of connections, number of SPVCs, number of SVCs, and SFPs (if applicable) supported by each back card.

Table 2-18 MPSM-T3E3-155 Back Cards, Lines, SFPs and Maximum Connections

Back Card	Line Type	Maximum # of Lines per Card	Supported SFPs[1]	Maximum # of Connections per Card
SFP-2-155	OC3	1 (the second interface is used only for APS)	• MMFSR-1-155-SFP (short range MMF) • SMFSR-1-155-SFP (short range SMF) • SMFLR-1-155-SFP (long range SMF)	4000
SMB-2-155-EL	OC3	1 (the second interface is used only for APS)	None	4000
BNC-3-T3	T3	3	None	4000
BNC-3-E3	E3	3	None	4000

1. Replaceable transceivers called Small Form Factor Pluggable (SFP) units. SFPs are hot-pluggable, and the MPSM-T3E3-155 software detects the removal and insertion of the SFP. This means that you can remove and insert an SFP at any time without affecting the front card status. You can replace one type of SFP with a different type of SFP without causing a mismatch (for example, you can replace an MMFSR-1-155-SFP with an SMFLR-1-155-SFP). You can not replace a supported SFP with an unrecognized (non-supported) SFP.

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The MPSM-T3E3-155 card supports the features as summarized in Table 2-19.

Table 2-19 MPSM-T3E3-155 Supported Feature Summary

Feature Grouping	Description
General	• Two channelized or unchannelized OC-3/STM-1 interfaces (the second of which is reserved for APS), or three channelized or unchannelized T3/E3 interfaces. • 1:1 and 1+1 intracard APS for SONET interfaces. • 1+1 intercard APS for SONET interfaces. • Onboard T1 BERT. • FDL/FEAC fault management and performance management • SPVCs, SVCs, SPVPs and PVPs • FR-to-FR, ATM-to-ATM, FR-to-ATM, ATM-to-FR, ATM-to-VISM, SPVC connection types, where one of end-points resides on the MPSM-T3E3-155 card. • OAM fault management. • Statistics collection and upload to Cisco Wan Manager (CWM). • Configuration upload to CWM. • 1:1 hot standby redundancy. • Standard MGX RAS features. • Connection provisioning on a PNNI control plane using the MSF switch architecture based VSI (Virtual Switch Interface). (MGX 8850 only). • Licensing of ATM and Frame Relay features.
Frame Relay	• Up to 3 T3 worth of frame relay traffic. • n x DS0, DS1/E1, DS3/E3, OC-3/STM-1 logical frame relay interfaces. • Up to 1000 logical frame relay interfaces. • Up to 4000 user provisioned frame relay connections. • FR UNI/FR NNI/Frame Forwarding interfaces. • FRF.5 (NIW) and FRF.8.1 (SIW) standards. • LMI and Enhanced LMI on all Frame Relay interfaces. • Frame Relay traffic management.
ATM	• Up to OC-3 worth of ATM traffic. • DS1/E1, n x DS1/n x E1 (IMA), DS3/E3, OC-3/STM-1 logical ATM interfaces. • Up to 4000 ATM connections. • VPCs and VCCs. • Up to 84 ATM UNI/NNI interfaces with signalling. • Up to 128 ATM VUNI/VNNI/EVUNI/EVNNI interfaces with signalling. • IMA version 1.0 and 1.1. • ILMI on all ATM interfaces. • ATM traffic management features.

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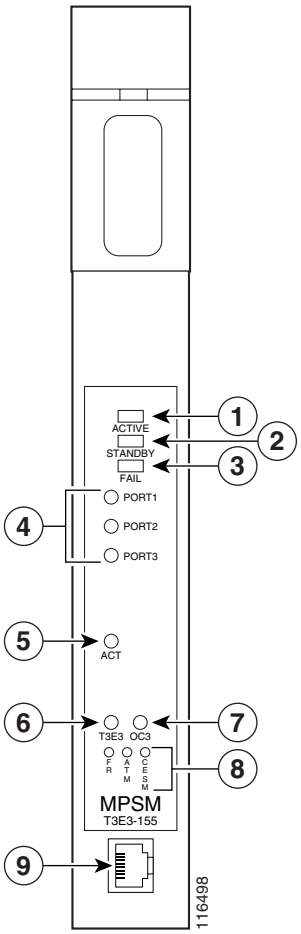
For more details on configuring, provisioning, licensing, and other details when using the MPSM-T3E3-155 card, refer to *Cisco ATM and Frame Relay Services (MPSM-T3E3-155 and MPSM-16-T1E1) Configuration Guide and Command Reference for MGX Switches, Release 5.2.*

Figure 2-17 shows an MPSM-T3E3-155 faceplate.

Figure 2-17 MPSM-T3E3-155 Faceplate



1	Active LED	**2**	Standby LED
3	Failure LEDs	**4**	Port LEDs
5	ACT LED	**6**	T3E3 Mode LED
7	OC3 Mode LED	**8**	Service LED (ATM, FR)
9	Console Port		

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MPSM-16-T1E1

Supported models: MGX 8850 (PXM1E/PXM45), MGX 8850/B (PXM1E/PXM45), MGX 8830, MGX 8830/B

The MPSM-16-T1E1 is a single-height front card that accommodates one single-height back card and fits into a slot in the upper or lower bay of the following chassis systems:

- MGX 8850 (PXM1E/PXM45) and MGX 8850/B
- MGX 8830 and MGX 8830/B

The MPSM-16-T1E1 front card supports 16 ports with T1/E1 capabilities, depending upon which back card it is installed with.

Table 2-20 lists the different MPSM-16-T1E1 back card types, line types, and redundancy supported by each back card.

Table 2-20 MPSM-16-T1E1 Back Cards, Lines, and Redundancy

Back Card	Line Type	Redundancy	Comment
RBBN-16-T1E1	T1,E1	1:1 Y-Cable	Currently supported by AXSME-32-T1E1 and PXM1E-16-T1E1 modules.
MCC-16-E1	E1	1:1 Y-Cable	Currently supported by AXSME-32-T1E1 and PXM1E-16-T1E1 modules.
RBBN-16-T1E1-1N	T1,E1	1:N	Both of these cards require a redundancy connector: • RCON-IT03-8850 or RCON-IT05-8850 in MGX 8850/B • RCON-IT03-8830 in MGX 8830/B
MCC-16-E1-1N	E1	1:N	
RED-16-T1E1	T1,E1	1:N	Redundant back card for either RBBN-16-T1E1-1N or MCC-16E1-1N.

The preferred tools for configuring, monitoring, and controlling service modules are the CiscoView and Cisco WAN Manager applications for equipment management and connection management. However, the command-line interface (CLI) also provides access to the service modules and is highly applicable during initial installation, troubleshooting, and any situation in which low-level control is useful.

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The MPSM-16-T1E1 card supports the features as summarized in Table 2-21.

Table 2-21 MPSM-16-T1E1 Supported Feature Summary

Feature Grouping	Description
General	• Support for SPVCs, SVCs, SPVPs and PVPs. • Maximum of 2000 connections supported. Any combination of Frame Relay and ATM connections is allowed. • Support for FR-FR, FR-ATM, ATM-FR, ATM-VISM, SPVC connection types, where one of end-points resides on the MPSM-16-T1E1 card. • Support for OAM fault management. • Support for statistics collection and upload to Cisco Wan Manager (CWM). • Support for configuration upload to CWM. • 1:1 hot standby redundancy plus standard MGX RAS features. • 1:N cold standby redundancy • Connections provisioned on PNNI control plane on the MGX 8850 platform using the MSF switch architecture based VSI (Virtual Switch Interface). • Provisioning XPVC endpoints supported on this card. • Licensing of the features supported by card.
Supported Services	• Frame Relay • ATM • Inverse Multiplexing for ATM (IMA) • Any Service Any Port (ASAP)
Physical Layer	• Physical interfaces configurable as channelized or unchannelized ports for: – 16 T1 connections – 16 E1 connections • Fault management and performance management for T1 and E1 interfaces. • BERT support.

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Table 2-21 MPSM-16-T1E1 Supported Feature Summary (continued)

Feature Grouping	Description
Frame Relay	• Handles up to 16 E1 worth of Frame Relay traffic. • Support for n x DS0 and T1/E1 Frame Relay interfaces. • Support for up to 496 logical Frame Relay interfaces. • Support for up to 2000 user provisioned Frame Relay connections. • Support for FR UNI/FR NNI/frame forwarding interfaces. • Support for FRF.5 (NIW) and FRF.8.1 (SIW) standards. • Support for LMI/Enhanced LMI on all Frame Relay interfaces. • Frame Relay traffic management features.
ATM	• Handles up to 16 E1 worth of ATM traffic. • Support for T1 and E1 ATM interfaces. • Support for up to 2000 ATM connections. • Support for VPCs and VCCs. • Support for up to 32 ATM UNI/NNI/VUNI/VNNI/EVUNI/EVNNI interfaces with signalling. • Support for IMA version 1.0 and 1.1 with fallback support and auto restart support. • Support for ILMI on all ATM interfaces. • ATM traffic management features (includes ABR VS/VD) • VCC/VPC shaping

For more details on configuring, provisioning, licensing and other details for using the MPSM-T3E3-155 card, refer to *Cisco ATM and Frame Relay Services (MPSM-T3E3-155 and MPSM-16-T1E1) Configuration Guide and Command Reference for MGX Switches, Release 5.2.*

Figure 2-18 shows an MPSM-16-T1E1 faceplate.

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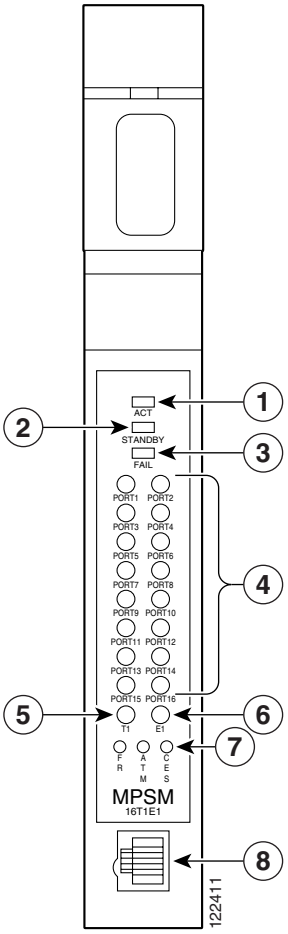
Figure 2-18 MPSM-16-T1E1 Faceplate



1	Active LED	**2**	Standby LED
3	Failure LED	**4**	Port LEDs
5	T1 Mode LED	**6**	E1 Mode LED
7	Service LED (FR, ATM	**8**	Console Port

PXM1E

Supported models: MGX 8830, MGX 8830/B, MGX 8850 (PXM1E), MGX 8850/B (PXM1E)

The PXM1E is a Private Network-to-Network Interface (PNNI)-enabled, double-height switch controller that provides switching capabilities for use at the ATM network edge. The *PXM1E* contains the processing intelligence, controls the Cisco MGX switch, and supports external interfaces for user access and NNI/UNI ports.

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*The PXM1E is pa*rt of a card set that cons*ists of a PXM1E, a user interface back card, and* an NNI/UNI *port back card. The switch can support up to two card sets.*

One PXM1E user interface back card (PXM-UI-S3 or PXM-UI-S3/B) provides management interfaces for configuring the switch, using external clocks, and triggering external alarms. The user interface back card is installed in the top bay of the switch (when the switch is viewed from the rear) behind the PXM1E.

Note Only the PXM-UI-S3 is supported in Release 3.0.00. The PXM-UI-S3/B is supported in Release 3.0.10 and higher.

One PXM1E NNI/UNI port back card serves as either an NNI or a UNI and is installed in the lower rear bay of the switch (when the switch is viewed from the rear) behind the PXM1E.

The PXM1E operates with the following module types:

- AUSM, page 2-10
- CESM, page 2-23
- FRSM, page 2-27
- RPM-PR, page 2-62
- SRM, SRME, and SRME/B: SRM, page 2-68
- VISM-PR, page 2-77

Note The PXM1E does not contain a crossbar switch; therefore, it cannot operate with broadband service modules such as the AXSM, FRSM-12-T3E3, and RPM-XF.

For specific module support in the MGX 8850 (PXM1E), MGX 8850/B (PXM1E), MGX 8830, or MGX 8830/B switch, see Table 1-3.

The PXM1E does not function as a feeder to any product.

The PXM1E supports the following features:

- Both UNI and NNI protocols
- Up to 4000 logical ports in the switch
- Standby switchover from active in approximately 250 milliseconds
- PNNI reroute time of approximately 100 calls per second

Table 2-22 provides information about each PXM1E card, interface, and corresponding back card.

Caution The PXM1E-4-155 does not need an APS connector to support APS line redundancy. However, it is recommended that you install the PXM1E-4-155 in an APS connector to support a seamless upgrade to the PXM1E-8-155.

The procedure to upgrade a PXM1E-4-155 card to a PXM1E-8-155 card is described in the *Cisco MGX 8800/8900 Series Configuration Guide, Release 5.2*. The "Obtaining Documentation" section explains how to find these documents online.

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The PXM1E-8-155 NNI/UNI back cards must be installed in an APS assembly to support APS line redundancy. See the "APS Assembly" section on page 1-28 for additional information.

Table 2-22 PXM1E Cards, Interfaces, and Supported Back Cards

PXM1E	Types of Lines Supported	Supported Back Cards
PXM1E-4-155	Up to 4 OC-3c interfaces	User interface back card: • PXM-UI-S3 or PXM-UI-S3/B NNI/UNI back cards: • MMF-4-155/C • SMFIR-4-155/C • SMFLR-4-155/C
PXM1E-8-155	Up to 8 OC-3c interfaces	User interface back card: • PXM-UI-S3/B NNI/UNI back cards: • MCC-8-155 • SFP-8-155 Transceivers for the SFP-8-155: – MMF-1-155-SFP – SMFIR-1-155-SFP – SMFLR-1-155-SFP
PXM1E-8-T3E3	Up to 8 T3/E3 interfaces	User interface back card: • PXM-UI-S3 or PXM-UI-S3/B NNI/UNI back cards: • SMB-8E3 • SMB-8T3
PXM1E-16-T1E1	Up to 16 T1/E1 interfaces and up to 8 IMA groups	User interface back card: • PXM-UI-S3/B NNI/UNI back cards: • MCC-16-E1 • RBBN-16-T1E1
PXM1E-COMBO	Up to 4 OC-3c and 8 T3/E3 interfaces	User interface back card: • PXM-UI-S3 or PXM-UI-S3/B NNI/UNI back cards: • T3E3-155 Transceivers: – MMF-1-155-SFP – SMFIR-1-155-SFP – SMFLR-1-155-SFP

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Note For information on PXM1E software features and configurations, refer to the *Cisco MGX 8800/8900 Series Configuration Guide, Release 5.2*. For technical specifications for the PXM1E cards, see the "PXM1E Specifications" section on page A-3.

Module Configurations

PXM1E card redundancy is preconfigured on the Cisco MGX switches. If PXM1Es are inserted in both slots 7 and 8 on an MGX 8850 (PXM1E) switch or slots 1 and 2 on an MGX 8830 switch, they automatically operate as redundant cards. If you install only one PXM1E in the switch, it operates as a standalone card. It is recommended that you install two to provide fault tolerance for the PXM1E. If one card goes down, a redundant card takes over.

Note For the PXM1E card to operate redundantly, Y-cabling or 1+1 card and APS line redundancy must be present on the ATM and external clock ports on the back cards.

The following module configurations are supported for the PXM1E:

- Standalone.
- Card set redundancy (Y-cable)—Redundant PXM1Es must be placed in slots 1 and 2 for MGX 8830 or slots 7 and 8 for MGX 8850 (PXM1E).
- 1:1 APS line redundancy (intracard)—OC-3c interfaces only.
- 1+1 card and APS line redundancy (intercard)—on PXM1E-4-155 and PXM1E-8-155.
- IMA—PXM1E-16-T1E1 only.

Note For module configuration information, refer to Chapter 4, "Planning for Card Redundancy, Line Redundancy, and Bulk Distribution".

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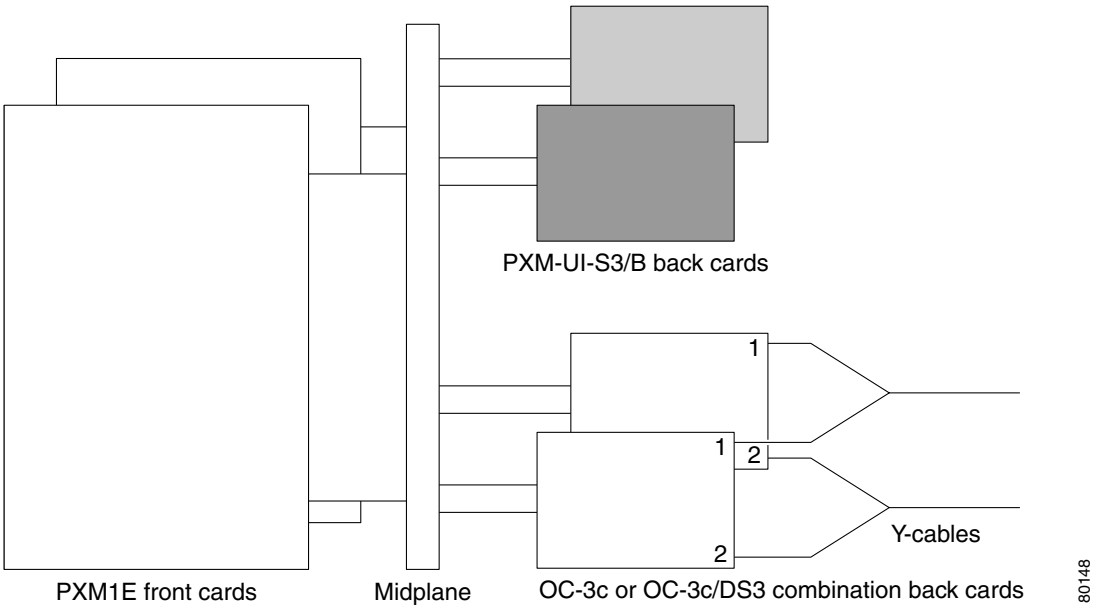
Figure 2-19 shows how redundant PXM1Es connect to standalone lines.

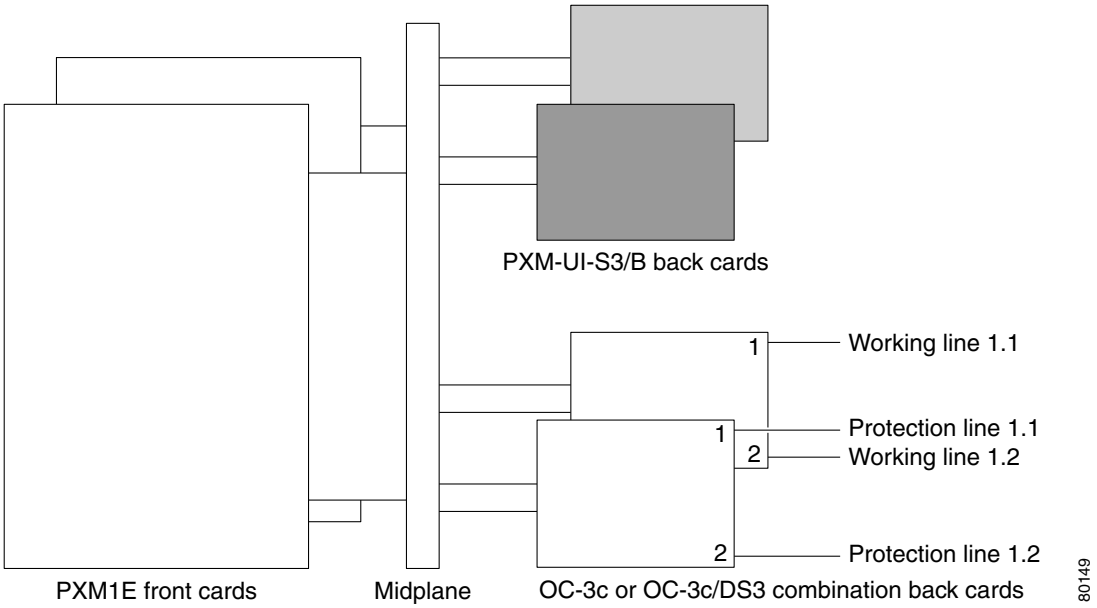
Figure 2-19 Card Set Redundancy Configuration—PXM1Es



Note In Figure 2-19, the clock ports on the UI-S3 back cards must be Y-cabled.

Figure 2-20 shows how redundant PXM1Es connect to redundant APS lines.

Figure 2-20 1+1 Card and APS Line Redundancy Configuration—PXM1Es



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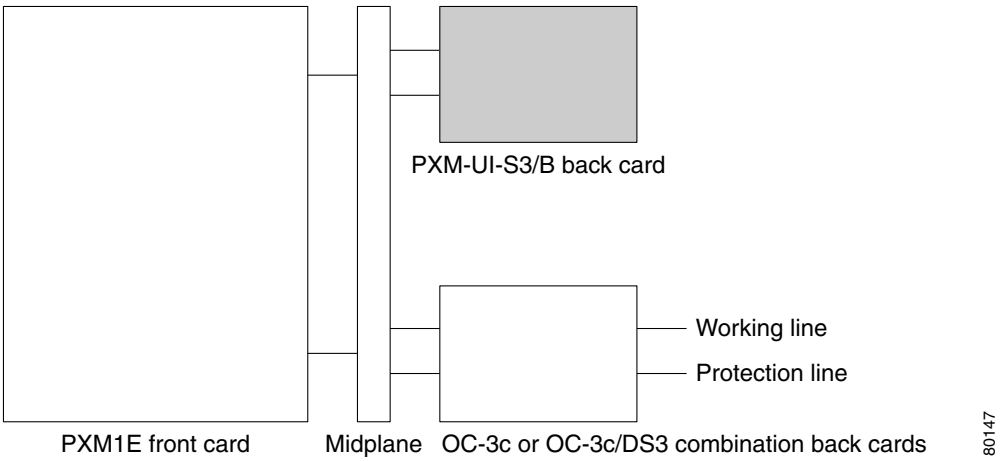
Note In Figure 2-20, the clock ports on the UI-S3 back cards must be Y-cabled.

Figure 2-21 shows how a single PXM1E connects to redundant APS lines.

Figure 2-21 1:1 APS Line Redundancy Configuration—PXM1Es



Faceplate Features

There are four models of the PXM1E (see Figure 2-22 through Figure 2-26). Table 2-23 describes LEDs on the PXM1Es.

Table 2-23 PXM1E LEDs

LED	Status	Description
E1, E3, T1, or T3	Green	The module is in E1, E3, T1, or T3 mode.
CR	Blue	A critical alarm is active.
MJ	Red	A major alarm is active.
MIN	Yellow	A minor alarm is active.
DC-A	Green	The first power supply is operating correctly.
	Red	The first power supply has failed.
DC-B	Green	The second power supply is operating correctly.
	Red	The second power supply has failed.
ACO	Yellow	An audible alarm is on. **Note** Press the **ACO** button to turn the audible alarm off.
HIST	Green	There is alarm history on the card. **Note** Press the **HIST** button to clear the alarm history.
ENET	Flashing green	Traffic is detected on the Ethernet interface.

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Table 2-23 PXM1E LEDs (continued)

LED	Status	Description
STATUS	Red	The module is in Reset mode.
	Blinking red	The module is booting up from boot flash. The PXM1E prompt will appear on the screen.
	Blinking yellow	The module is booting and initializing or the module is in Standby mode.
	Blinking green	The module is active.
PORT *x* **Note** The number of ports varies with the type of PXM1E installed in your system.	Green	The port is active with no alarms detected.
	Red	A local alarm exists on the port.
	Yellow	A remote alarm exists on the port.
	Off	The port is inactive or not provided.

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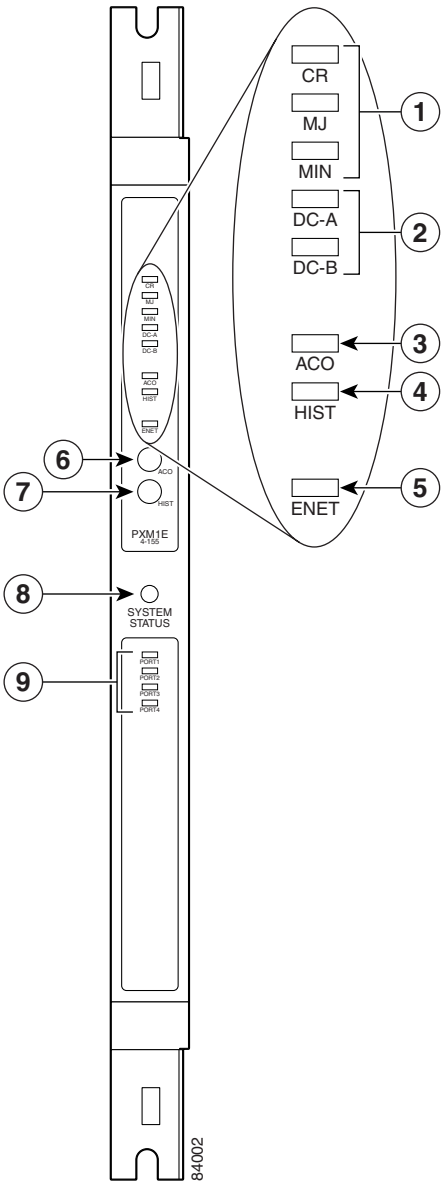
PXM1E-4-155

Figure 2-22 shows a PXM1E-4-155 faceplate. Table 2-23 contains LED descriptions.

Figure 2-22 PXM1E-4-155 Faceplate



1	CRITICAL, major, and minor alarm LEDs (CR, CJ, and MIN)	**6**	Alarm cutoff button (ACO)
2	Power supply LEDs (DC-A and DC-B)	**7**	History button (HIST)
3	Alarm cutoff LED (ACO)	**8**	SYSTEM STATUS LED
4	History LED (HIST)	**9**	PORT 1 through PORT 4 LEDs
5	Ethernet LED (ENET)		

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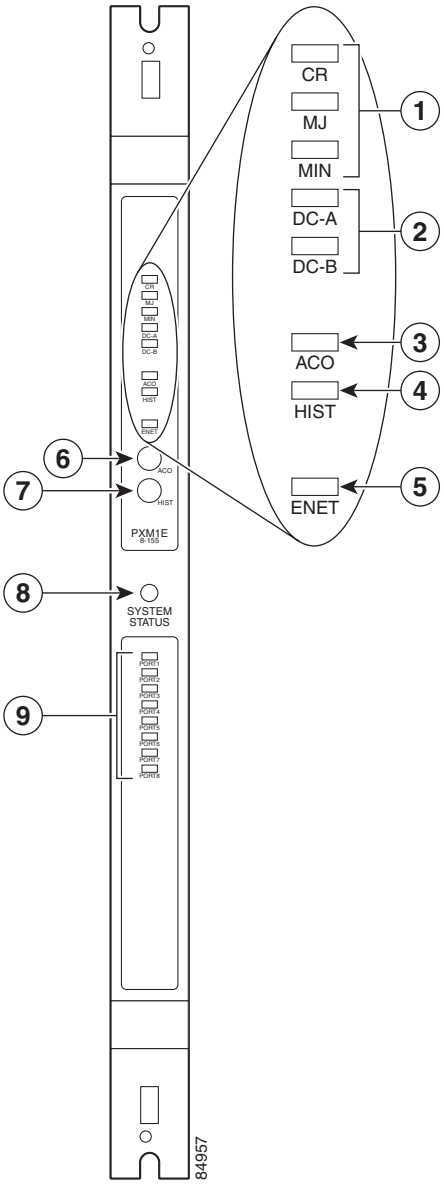
PXM1E-8-155

Figure 2-23 shows a PXM1E-8-155 faceplate. Table 2-23 contains LED descriptions.

Figure 2-23 PXM1E-8-155 Faceplate



1	CRITICAL, major, and minor alarm LEDs (CR, CJ, and MIN)	**6**	Alarm cutoff button (ACO)
2	Power supply LEDs (DC-A and DC-B)	**7**	History button (HIST)
3	Alarm cutoff LED (ACO)	**8**	SYSTEM STATUS LED
4	History LED (HIST)	**9**	PORT 1 through PORT 8 LEDs
5	Ethernet LED (ENET)		

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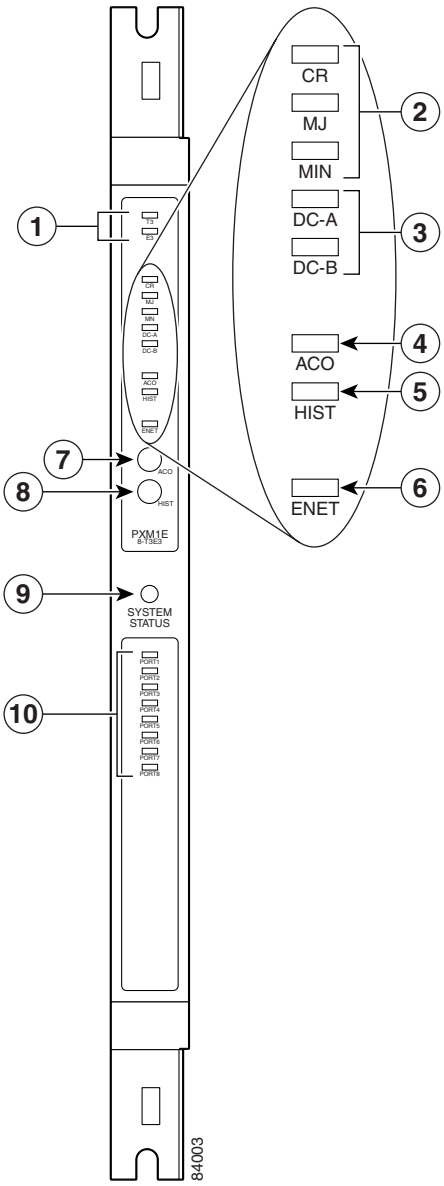
PXM1E-8-T3E3

Figure 2-24 shows a PXM1E-8-T3E3 faceplate. Table 2-23 contains LED descriptions.

Figure 2-24 PXM1E-8-T3E3 Faceplate



1	T3 and E3 LEDs	**6**	Ethernet LED (ENET)
2	CRITICAL, major, and minor alarm LEDs (CR, CJ, and MIN)	**7**	Alarm cutoff button (ACO)
3	Power supply LEDs (DC-A and DC-B)	**8**	History button (HIST)
4	Alarm cutoff LED (ACO)	**9**	SYSTEM STATUS LED
5	History LED (HIST)	**10**	PORT 1 through PORT 8 LEDs

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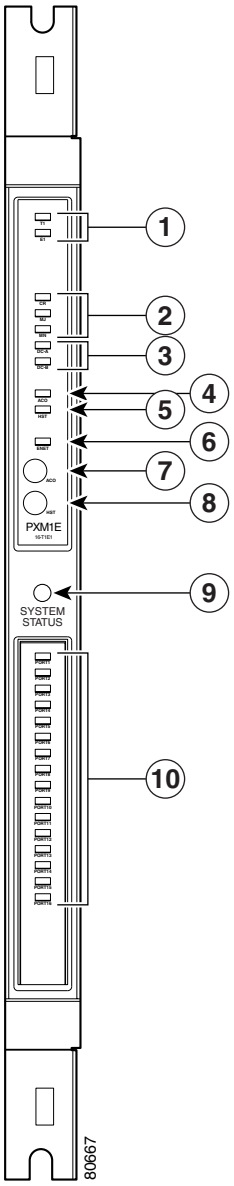
PXM1E-16-T1E1

Figure 2-25 shows a PXM1E-16-T1E1 faceplate. Table 2-23 contains LED descriptions.

Figure 2-25 PXM1E-16-T1E1 Faceplate



1	T1 and E1 LEDs	**6**	Ethernet LED (ENET)
2	CRITICAL, major, and minor alarm LEDs (CR, CJ, and MIN)	**7**	Alarm cutoff button (ACO)
3	Power supply LEDs (DC-A and DC-B)	**8**	History button (HIST)
4	Alarm cutoff LED (ACO)	**9**	SYSTEM STATUS LED
5	History LED (HIST)	**10**	PORT 1 through PORT 16 LEDs

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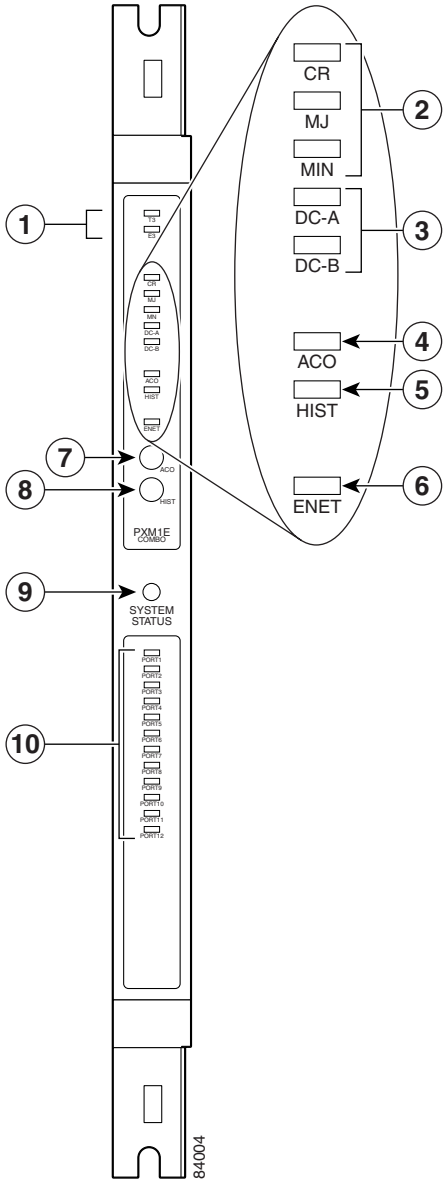
PXM1E-COMBO

Figure 2-26 shows a PXM1E-COMBO faceplate. Table 2-23 contains LED descriptions. The PXM1E-COMBO card is also called PXM1E-T3E3-155.

Figure 2-26 PXM1E-COMBO Faceplate (PXM1E-T3E3-155)



1	T3 and E3 LEDs	**6**	Ethernet LED (ENET)
2	CRITICAL, major, and minor alarm LEDs (CR, CJ, and MIN)	**7**	Alarm cutoff button (ACO)
3	Power supply LEDs (DC-A and DC-B)	**8**	History button (HIST)
4	Alarm cutoff LED (ACO)	**9**	SYSTEM STATUS LED
5	History LED (HIST)	**10**	PORT 1 through PORT 12 LEDs

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PXM45

Supported models: MGX 8850 (PXM45), MGX 8850/B (PXM45), MGX 8950, MGX 8880

The PXM45, PXM45/B, and PXM45/C allow service providers to implement a complete range of narrowband services for high-density edge applications and broadband aggregation with 45 Gbps of nonblocking switching.

Note In this guide, the PXM45, PXM45/B, and PXM45/C are identified collectively as the PXM45, unless otherwise specified.

In the MGX 8950, PXM45 cards are used as node controllers only. Their 45Gbps switching matrix is not used in the MGX 8950. Up to four XM60 cards provide up to 240G of non-blocking switching in the MGX 8950.

The PXM45 can also be used exclusively for broadband aggregation and backbone functions. The PXM45 controls the switch and supports external interfaces for user access.

*The PXM45 is pa*rt of a card set that cons*ists of a front card, a user interface back card, and a hard drive card. The switch can support up to two card sets.*

One user interface back card (PXM-UI-S3 or PXM-UI-S3/B) provides management interfaces for configuring the switch with external clocks and triggering external alarms. The user interface back card is installed in the top bay of the switch (when the switch is viewed from the rear) behind the PXM45.

Note The PXM-UI-S3 is not supported with the PXM45/C cards. The PXM-UI-S3/B is not supported with the PXM45 cards or PXM45/B cards.

One hard drive back card (PXM-HD) houses the disk drive that contains all switch and network-related information. The PXM-HD is installed in the bottom bay of the switch (when the switch is viewed from the rear) behind the PXM45.

PXM45 Support on MGX 8850 (PXM45) or MGX 8850/B (PXM45)

The PXM45 operates with the following module types:

- AXSM, page 2-13
- CESM, page 2-23
- FRSM, page 2-27
- FRSM-12-T3E3, page 2-34
- RPM-PR, page 2-62
- RPM-XF, page 2-65
- SRM, SRME, SRM-3T3/C, and SRME/B: SRM, page 2-68
- VISM-PR, page 2-77
- XM60, page 2-89 (this configuration does not ship from the factory)

Note For a detailed list of supported modules for the MGX 8850 (PXM45) or MGX 8850/B (PXM45) switch, see Table 1-3.

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PXM45 Support on MGX 8950

The MGX 8950 switch was introduced with PXM45/B, and can use the PXM45/B or PXM45/C card. In an MGX 8950 switch, the PXM45/B or PXM45/C card operates with the following module types:

- AXSM/B, AXSM-XG
- RPM-PR, RPM-XF

Note For a detailed list of supported modules for the MGX 8950 switch, see Table 1-3.

Table 2-24 provides information about each PXM45 card, interface, and corresponding back card.

Table 2-24 PXM45 Cards, Interfaces, and Supported Back Cards

PXM45	Switch	Types of Lines Supported	Supported Back Cards
PXM45	MGX 8850 (PXM45)	Management, clock, and alarm	User interface back card: • PXM-UI-S3 Hard drive card: • PXM-HD
PXM45/B	MGX 8850 (PXM45) MGX 8950	Management, clock, and alarm	User interface back card: • PXM-UI-S3 Hard drive card: • PXM-HD
PXM45/C	MGX 8850 (PXM45) MGX 8950	Management, clock, and alarm	User interface back card: • PXM-UI-S3/B Hard drive card: • PXM-HD

Note For information on PXM45 software features and configurations, refer to the *Cisco MGX 8800/8900 Series Configuration Guide, Release 5.2*. For technical specifications for the PXMs, see the "PXM45 Specifications" section on page A-5.

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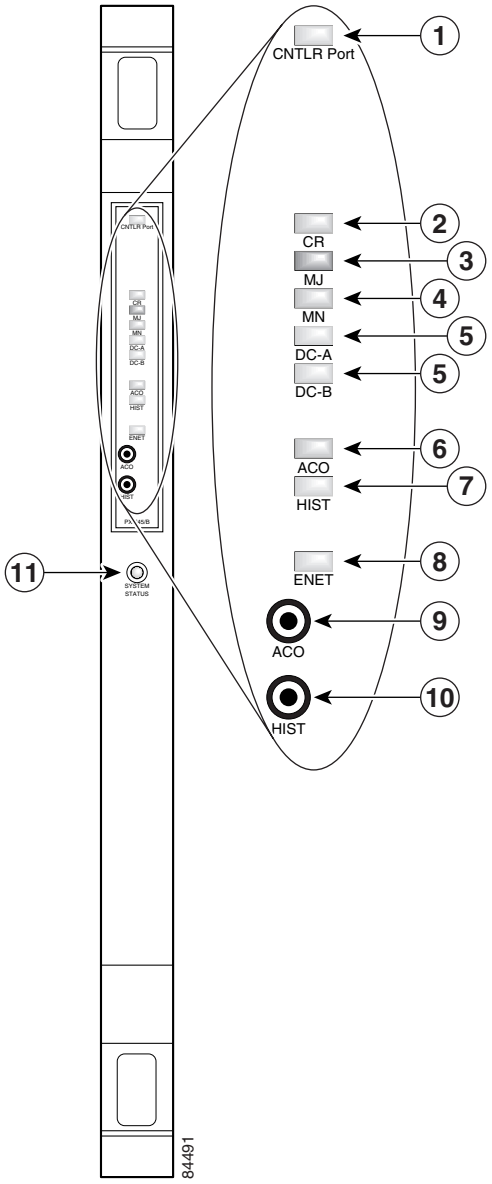
Faceplate Features

Figure 2-27 shows a PXM45 or PXM45/B faceplate. The faceplates look the same, except for the product name that is silk-screened on the front of each faceplate.

Figure 2-27 PXM45 and PXM45/B Faceplate



1	Controller port LED (CNTLR Port)	**7**	History LED (HIST)
2	Critical alarm LED (CR)	**8**	Ethernet LED (ENET)
3	Major alarm LED (MJ)	**9**	Alarm cutoff button (ACO)
4	Minor alarm LED (MN)	**10**	History button (HIST)
5	Power supply LEDs (DC-A and DC-B)	**11**	SYSTEM STATUS LED
6	Alarm cutoff LED (ACO)		

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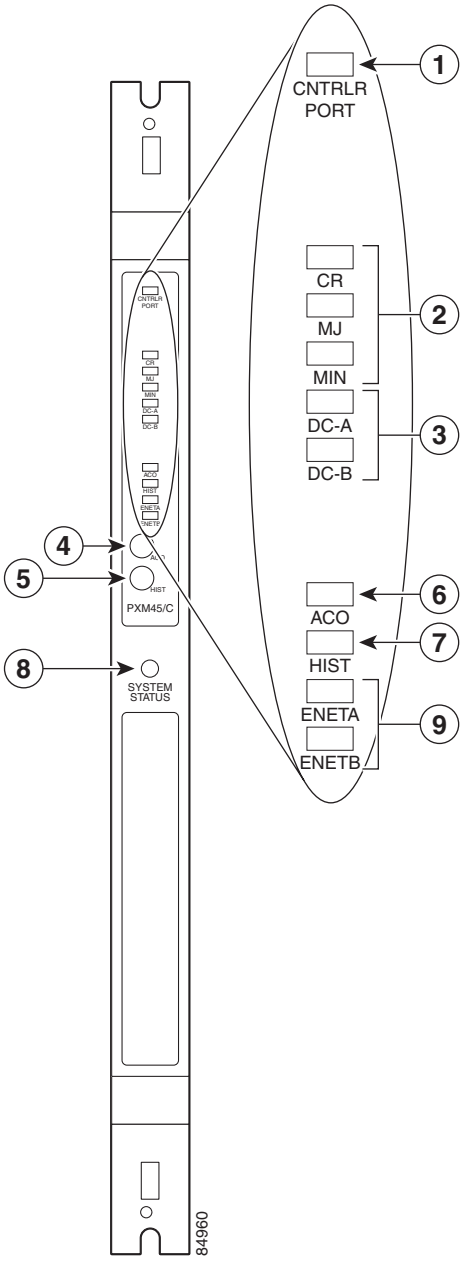
Figure 2-28 shows a PXM45/C faceplate.

Figure 2-28 PXM45/C Faceplate



1	Controller port LED (CNTLR Port)	**5**	History button (HIST)
2	Critical alarm LED (CR)	**6**	Alarm cutoff LED (ACO)
2	Major alarm LED (MJ)	**7**	History LED (HIST)
2	Minor alarm LED (MN)	**8**	SYSTEM STATUS LED
3	Power supply LEDs (DC-A and DC-B)	**9**	Ethernet LEDs (ENETA and ENETB)
4	Alarm cutoff button (ACO)		

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Table 2-25 describes LEDs on the PXM45 cards.

Table 2-25 PXM45 LEDs

LED	Status	Description
CNTLR Port	Green	The controller port is active.
	Red	A major alarm exists on the controller port.
	Yellow	A minor alarm exists on the controller port.
	Off	The port is inactive.
CR	Blue	A critical network alarm is active.
MJ	Red	A major network alarm is active.
MN	Yellow	A minor network alarm is active.
DC-A	Green	The first power supply is operating correctly.
	Red	The first power supply has failed.
DC-B	Green	The second power supply is operating correctly.
	Red	The second power supply has failed.
ACO	Yellow	An audible alarm is on. **Note** Press the **ACO** button to turn the audible alarm off.
HIST	Green	There is alarm history on the card. **Note** Press the **HIST** button to clear the alarm history.
ENET, ENETA, and ENETB	Flashing green	Traffic is detected on the Ethernet interface.
SYSTEM STATUS	Red	The module is in Reset mode.
	Blinking red	The module is booting up from boot flash. The PXM45 prompt will appear on the screen.
	Blinking yellow	The module is booting and initializing or the module is in Standby mode.
	Blinking green	The module is active.

Module Configurations

PXM45 card redundancy is preconfigured on the Cisco MGX switches. If PXM45 cards are inserted in both slots 7 and 8, they automatically operate as redundant cards. If you install only one PXM45 in the switch, it operates as a standalone card. It is recommended that you install two to provide fault tolerance for the PXM45. If one card goes down, a redundant card takes over.

Note For the cards to operate redundantly, Y-cabling must be present on the external clock ports on the back cards.

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The following module configurations are supported for the PXM45:

- Standalone.
- Card set redundancy (Y-cable).

Note For module configuration information, refer to Chapter 4, "Planning for Card Redundancy, Line Redundancy, and Bulk Distribution".

RPM-PR

Supported models: MGX 8850 (PXM1E/PXM45), MGX 8850/B (PXM1E/PXM45), MGX 8950, MGX 8830, MGX 8830/B, MGX 8880

The RPM-PR is a double-height service module that provides integrated IP on an ATM platform, enabling services such as integrated Point-to-Point protocol (PPP).

The RPM-PR:

- Provides an ATM interface to the switch and supports up to two port adapters, a four-port Ethernet (10BASE-T), and a one-port Fast Ethernet (unshielded twisted pair [UTP], MMF)
- Has a QED RM7000 processor subsystem that provides over 350 kilo packets per second (kpps) of throughput for IP packet forwarding
- Provides integrated IP in an ATM platform
- Has an attached daughter card that contains the processing intelligence and contains the firmware that determines the interface type (OC-3c, OC-12c, T3, E3, and so forth)

When the RPM-PR is combined with one or two back cards, a card set is created. Table 2-26 provides information about each RPM-PR card, interface, and corresponding back card.

Table 2-26 RPM-PR Cards, Interfaces, and Supported Back Cards

RPM-PR	Switch Interface	Supported Back Card	Ethernet Interfaces	Number of Ethernet Interfaces
RPM-PR-256 (256 MB DRAM)	NNI/UNI	MMF-FE	Fast Ethernet, 100BASE-FX; choice of SC or MII connector. MII connector requires external transceiver.	1
		RJ45-4E/B	Ethernet 10BASE-T	4
		RJ45-FE	Fast Ethernet, 100BASE-FX; choice of RJ-45 or MII connector. MII connector requires external transceiver.	1
		MGX-RPM-1FE-CP	Fast Ethernet, 100 BASE-TX, with coprocessor and RJ-45 connector.	1
		MGX-RJ45-5-ETH	Ethernet/Fast Ethernet/Gigabit Ethernet, 10 BASE-T, 100 BASE-TX, and 1000 BASE-T with RJ45 connector.	5

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Table 2-26 RPM-PR Cards, Interfaces, and Supported Back Cards (continued)

RPM-PR	Switch Interface	Supported Back Card	Ethernet Interfaces	Number of Ethernet Interfaces
RPM-PR-512 (512 MB DRAM)	NNI/UNI	MMF-FE	Fast Ethernet, 100BASE-FX; choice of SC or MII connector. MII connector requires external transceiver.	1
		RJ45-4E/B	Ethernet 10BASE-T.	4
		RJ45-FE	Fast Ethernet, 100BASE-FX; choice of RJ-45 or MII connector. MII connector requires external transceiver.	1
		MGX-RPM-1FE-CP	Fast Ethernet, 100 BASE-TX, with coprocessor and RJ-45 connector.	1
		MGX-RJ45-5-ETH	Ethernet/Fast Ethernet/Gigabit Ethernet, 10 BASE-T, 100 BASE-TX, and 1000 BASE-T with RJ45 connector.	5

Note For information on RPM-PR software features and configurations, refer to the *Cisco MGX Route Processor Module (RPM-PR) Installation and Configuration Guide, Release 5.2*. For technical specifications for the RPM-PR cards, see the "RPM-PR Specifications" section on page A-7.

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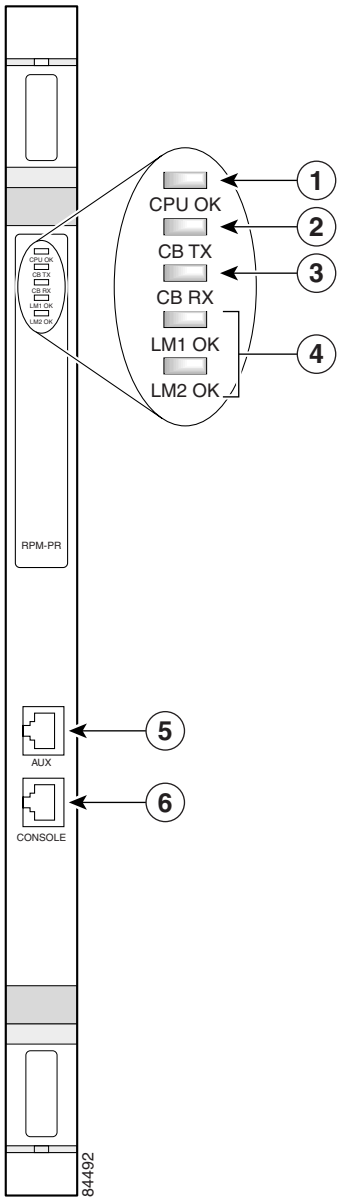
Faceplate Features

Figure 2-29 shows an RPM-PR faceplate.

Figure 2-29 RPM-PR Faceplate



1	CPU OK LED	**4**	LM1 OK and LM2 OK LEDs
2	CB TX LED	**5**	Auxiliary port (AUX)
3	CB RX LED	**6**	CONSOLE port

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Table 2-27 describes the LEDs on the RPM-PR.

Table 2-27 RPM-PR LEDs

LED	Status	Description
CPU OK	Green	The RPM-PR card set (front card and back cards) is in the active state.
	Yellow	The RPM-PR is in Standby mode.
	Red	The RPM-PR has failed.
	Off	The CPU is not operational.
CB TX	Green	Cells are being transmitted to the cell bus.
	Off	Cells are not being transmitted to the cell bus.
CB RX	Green	Cells are being received from the cell bus.
	Off	Cells are not being received from the cell bus.
LM1 OK	Green	There is a back card in the upper rear bay and the cable is connected.
	Red	There is a back card in the upper rear bay but the cable is not connected.
	Off	There is no back card in the upper rear bay.
LM2 OK	Green	There is a back card in the lower rear bay and the cable is connected.
	Red	There is a back card in the lower rear bay but the cable is not connected.
	Off	There is no back card in the lower rear bay.

Module Configurations

The RPM-PR supports the following module configurations:

- Standalone.
- 1:N card set redundancy—No SRM is required.

Note For module configuration information, refer to Chapter 4, "Planning for Card Redundancy, Line Redundancy, and Bulk Distribution".

RPM-XF

Supported models: MGX 8850 (PXM45), MGX 8850/B (PXM45), MGX 8950, MGX 8880

The RPM-XF cards are double-height service modules that support communication between non-ATM services (such as Frame Relay and IP) and the ATM services on an ATM network.

The RPM-XF:

- Provides integrated IP in an ATM platform, making possible such services as integrated PPP and IP virtual private networks (VPNs) that use MPLS technology.

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- Provides Cisco IOS-based multiprotocol routing over ATM and ATM interface Layer 3 termination, local server interconnect over high-speed LANs, access concentration, and switching between Ethernet LANs and the WAN interfaces of the Cisco MGX switch or gateway.
- Provides forwarding technology for packet switching capabilities in excess of 2 million pps. The forwarding engine is packet-based and is interfaced to the midplane of the system through a combination of switch interface technologies.
- Provides Cisco IOS router services and also provides ATM connectivity to the Cisco MGX switch serial interface at full-duplex OC-24.
- Uses an RM7000A MIPS processor, a parallel packet processing engine, an integrated ATM interface, and a serial interface ASIC to interface with the Cisco MGX switch serial interface controllers.

When an RPM-XF is combined with a high-speed uplink back card and a management back card, a card set is created. The RPM-XF card set consists of the RPM-XF-512 and the following back cards:

- MGX-XF-UI—A management back card that is always installed in the lower rear bay back slot directly behind the RPM-XF
- MGX-XF-UI/B—A “notched” management back card that is installed in rear bay. It fits into the RCON of the MGX 8880 Media Gateway, directly behind the RPM-XF
- MGX-1OC12POS-IR or MGX-1GE—A back card that is always installed in the upper rear bay back slot directly behind the RPM-XF

The MGX-1GE must have one of the following SFP transceivers installed on it:

- MGX-GE-LHLX (1000base-LH/LX SFP single-mode, standardized for MGX)
- MGX-GE-SX (1000base-SX SFP multimode, standardized for MGX)
- MGX-GE-ZX (1000base-ZX SFP single-mode, standardized for MGX)

Note Back cards are optional with the RPM-XF card.

Note For information on RPM-XF software features and configurations, refer to the *Cisco MGX Route Processor Module (RPM-XF) Installation and Configuration Guide, Release 5.2*. For technical specifications for the RPM-XF cards, see the “RPM-XF Specifications” section on page A-8.

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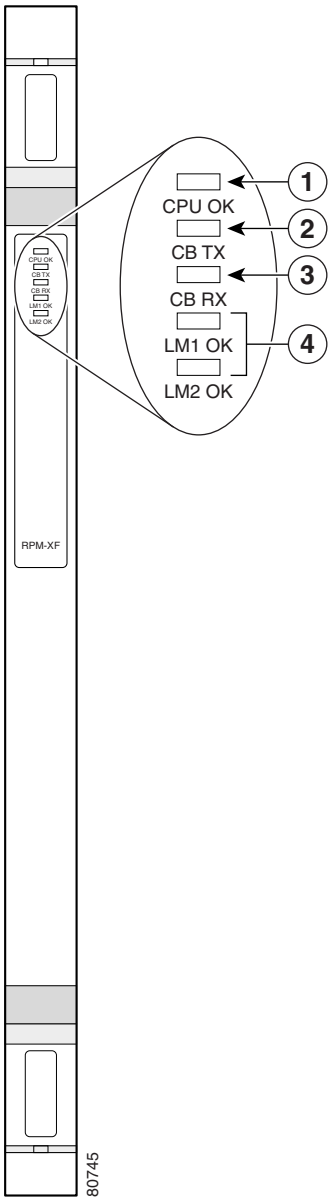
Faceplate Features

Figure 2-30 shows an RPM-XF faceplate. Table 2-28 contains LED descriptions.

Figure 2-30 RPM-XF Faceplate



1	CPU OK LED	**3**	CB RX LED
2	CB TX LED	**4**	LM1 OK and LM2 OK LEDs

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Table 2-28 describes the LEDs on the RPM-XF.

Table 2-28 RPM-XF LEDs

LED	Status	Description
CPU OK	Green	The RPM-XF card set (front card and back cards) is in the active state.
	Yellow	The RPM-XF is in Standby mode.
	Red	The RPM-XF has failed.
	Off	The CPU is not operational.
CB TX	Green	Cells are being transmitted to the cell bus.
	Off	Cells are not being transmitted to the cell bus.
CB RX	Green	Cells are being received from the cell bus.
	Off	Cells are not being received from the cell bus.
LM1 OK	Green	There is a back card in the upper rear bay and the cable is connected.
	Red	There is a back card in the upper rear bay but the cable is not connected.
	Off	There is no back card in the upper rear bay.
LM2 OK	Green	There is a back card in the lower rear bay and the cable is connected.
	Red	There is a back card in the lower rear bay but the cable is not connected.
	Off	There is no back card in the lower rear bay.

Module Configurations

The RPM-XF supports the following module configurations:

- Standalone.
- 1:N card set redundancy—No SRM is required.

Note For module configuration information, refer to Chapter 4, "Planning for Card Redundancy, Line Redundancy, and Bulk Distribution".

SRM

Supported models: MGX 8850 (PXM1E/PXM45), MGX 8850/B (PXM1E/PXM45), MGX 8830, MGX 8830/B, MGX 8880

The Service Resource Module (SRM) is a single-height card that provides three main functions for the service modules:

- Bit Error Rate Testing. See "Bit Error Rate Testing" section on page 2-75
- 1:N Card Set Redundancy—MGX 8850 (PXM45) and MGX 8850 (PXM1E)

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- Bulk Distribution—MGX 8830, MGX 8850 (PXM45), and MGX 8850 (PXM1E)

For module configuration information, refer to Chapter 4, "Planning for Card Redundancy, Line Redundancy, and Bulk Distribution".

The following are card-level characteristics that apply to any SRM installation:

- No other service modules can be installed in the SRM slots because the slots do not have cell bus connections. The SRM cards use a local bus to communicate with the PXM45 or PXM1E installed in the same bay. Only SRM cards can be installed in slots:
  - 15, 16, 31, and 32 for an MGX 8850 (PXM1E or PXM45) switch.
  - 7 and 14 for an MGX 8830 switch.
- On an MGX 8850 (PXM1E or PXM45) switch, the PXM45 or PXM1E in slot 7 controls the SRM cards in slots 15 and 31. The PXM45 or PXM1E in slot 8 controls the redundant SRM cards in slots 16 and 32.
- On an MGX 8830, the PXM1E in slot 1 controls the SRM card in slot 7, and the PXM1E in slot 2 controls the redundant SRM card in slot 8.
- Both SRM cards in a pair must be the same model. You can have two SRM-3T3/Cs or two SRME cards. However, you cannot mix an SRME with an SRM-3T3/C.
- The PXM45 cards support only the SRME card.

When the SRM is combined with a back card, a card set is created. Table 2-29 provides information about each SRM card, interface, and corresponding back card.

Note Back cards are optional for BERT and 1:N card set redundancy.

Table 2-29 SRM Cards, Interfaces, and Supported Back Cards

SRM	Supported Back Card	Interface Connection	Types of Lines Supported	Number of Lines Supported
SRM-3T3/C	BNC-3T3/C	Channelized T3	T3	3
SRME/B	SMFIR-1-155	Channelized T3	T3	3
	STM1-EL-1	Channelized 155 Mbps	STM1 SDH	1
SRME	SMFIR-1-155	Channelized 155 Mbps	OC-3c/STS SONET	1
	STM1-EL-1	Channelized 155 Mbps	STM1 SDH	1

Note For technical specifications for the SRM cards, see the "SRM Specifications" section on page A-8.

SRM-3T3/C

Supported models: MGX 8850 (PXM1E/PXM45), MGX 8850/B (PXM1E/PXM45), MGX 8830, MGX 8830/B

The SRM-3T3/C provides bulk distribution (on T1 lines only), 1:N card set redundancy for the T1 and E1 service modules, and bit error rate testing (BERT). Bulk distribution manages traffic over T3 interfaces and is supported for T1 interface speeds only.

Figure 2-31 shows an SRM-3T3/C faceplate.

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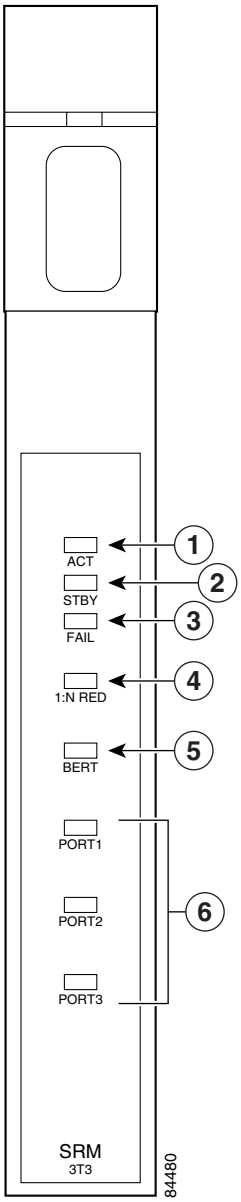
Figure 2-31 SRM-3T3/C Faceplate



1	Active LED (ACT)	**4**	1:N RED LED
2	Standby LED (STBY)	**5**	BERT LED
3	FAIL LED	**6**	PORT 1 through PORT 3 LEDs

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Table 2-30 describes the LEDs on the SRM-3T3/C and SRME/B.

Table 2-30 SRM-3T3/C and SRME/B LEDs

LED	Color	Function
ACT	Green	The SRM-3T3/C card set (front card and back card) is in active state.
STBY	Yellow	The SRM-3T3/C card set (front card and back card) is in Standby mode.
FAIL	Red	When this LED is solid red and the ACT and STBY LEDs are off, one of the following conditions exists: • The module has failed. • The card set is not complete (no back card).
PORT 1 through PORT 3	Green	The port is active with no alarms detected.
	Red	The port is active and a local alarm has been detected.
	Yellow	The port is active and a remote alarm has been detected.
	Off	The port is not configured, or the card set is configured as a redundant card set and is in Standby mode.
1:N RED	Green	1:N card set redundancy has been invoked.
	Off	1:N card set redundancy is not active.
BERT	Green	The BERT function is active.
	Off	The BERT function is not active.

SRME

Supported models: MGX 8850 (PXM1E/PXM45), MGX 8850/B (PXM1E/PXM45), MGX 8830, MGX 8830/B

The SRME provides bulk distribution for T1 and E1 lines, 1:N card set redundancy for T1 and E1 service modules, and BERT. Bulk distribution is managed over 155 Mbps interfaces through use of OC-3c or STM1. The SRME also supports APS line redundancy when the OC-3c back card is used.

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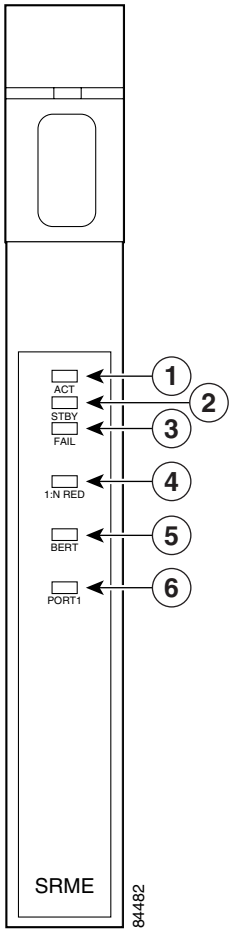
Figure 2-32 shows an SRME faceplate.

Figure 2-32 SRME Faceplate



1	Active LED (ACT)	**4**	1:N RED LED
2	Standby LED (STBY)	**5**	BERT LED
3	FAIL LED	**6**	PORT 1 LED

Table 2-31 describes the LEDS on the SRME card.

Table 2-31 SRME LEDs

LED	Color	Function
ACT	Green	The SRME card set (front card and back card) is in active state.
STBY	Yellow	The SRME card set (front card and back card) is in Standby mode.

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Table 2-31 SRME LEDs (continued)

LED	Color	Function
FAIL	Red	When this LED is solid red and the ACT and STBY LEDs are off, one of the following conditions exists: • The module has failed. • The card set is not complete (no back card).
PORT 1	Green	The port is active with no alarms detected.
	Red	The port is active and a local alarm has been detected.
	Yellow	The port is active and a remote alarm has been detected.
	Off	The port is not configured, or the card set is configured as a redundant card set and is in Standby mode.
1:N RED	Green	1:N card set redundancy has been invoked.
	Off	1:N card set redundancy is not active.
BERT	Green	The BERT function is active.
	Off	The BERT function is not active.

SRME/B

Supported models: MGX 8850 (PXM1E/PXM45), MGX 8850/B (PXM1E/PXM45), MGX 8830, MGX 8830/B, MGX 8880

SRME/B stands for Service Resource Module, Enhanced, Revision B. The SRME/B combines the characteristics of the SRME and SRM-3T3/C—it supports 1 OC-3/STM-1 port channelized to T1/E1 like SRME, and 3 DS3 ports channelized to T1, like SRM-3T3/C. The SRME/B can coexist with earlier version SRM cards, yet with the SRME/B, you no longer have two carry two separate SRM types.

See the "SRM" section on page 2-68 for general details on SRM cards.

Note The MGX 8880 Media Gateway uses only the SRME/B card.

Module Configurations

SRM redundancy is preconfigured on the Cisco MGX switches. On an MGX 8850 (PXM1E/PXM45) or MGX 8850/B (PXM1E/PXM45), if SRM cards are inserted in slots 15 and 31 and 16 and 32, they automatically operate as redundant cards. If you install only one SRM in the switch, it operates as a standalone card.

It is recommended that you install two to provide fault tolerance. If one card or line goes down, a redundant card or line takes over. The following module configurations are supported for the SRM:

- Standalone.

Caution SRM cards can operate in a standalone configuration. However, it is not recommended that you use this configuration if SRM cards are operating as back cards for service modules (1:N card set redundancy configuration).
If you have two PXMs installed in your switch (one active and one standby), you must have redundant SRM cards (one active and one standby) installed in each bay.

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On an MGX 8850 (PXM1E or PXM45), the PXM card in slot 7 controls the SRM cards in slots 15 and 31. The PXM card in slot 8 controls the redundant SRM cards in slots 16 and 32.

On an MGX 8830, the PXM1E card in slot 1 controls the SRM card in slot 7. The PXM1E card in slot 8 controls the redundant SRM card in slot 14.

- Card set redundancy (Y-cable)—Redundant SRM cards must be placed in slots 15 and 16 for the upper bay and 31 and 32 for the lower bay of the switch.
- 1+1 card and APS line redundancy (intercard)—OC-3c interfaces only.

Note Only the SRME supports APS.

Note For module configuration information, refer to Chapter 4, "Planning for Card Redundancy, Line Redundancy, and Bulk Distribution".

Figure 2-33 shows how redundant SRM cards connect to standalone lines.

Figure 2-33 Card Set Redundancy Configuration—SRM Cards

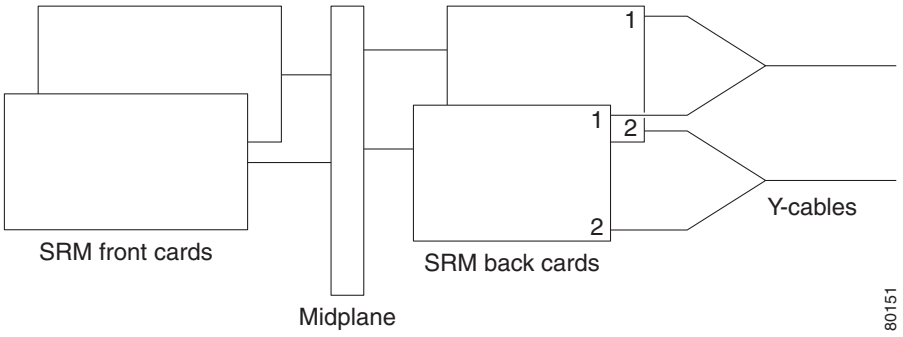
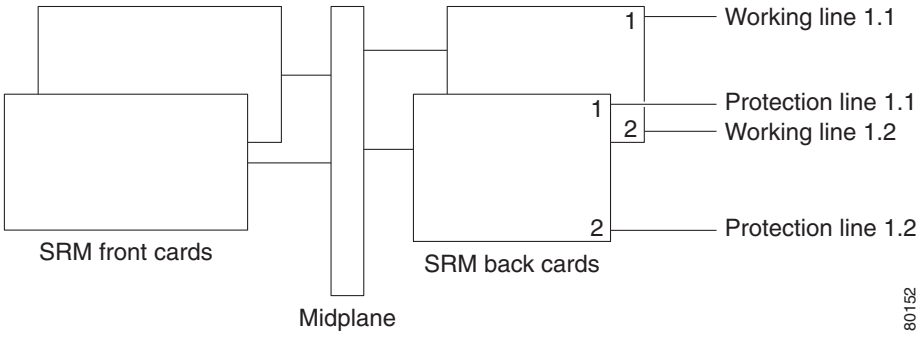


Figure 2-34 shows how redundant SRM cards connect to redundant APS lines.

Figure 2-34 1+1 Card and APS Line Redundancy Configuration—SRM Cards



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Bit Error Rate Testing

After a service module line or port is put into loopback mode, the SRM can generate a test pattern over the looped line or port, read the received looped data, and report on the error rate. This operation can be performed on a complete T1 or E1 line, on a fractional T1 or E1 line, on a DS0 bundle (N x DS0), or on a single DS0 channel.

The SRM can support BERT on only one line or channel at a time. BERT can generate a variety of test patterns, including all ones, all zeros, alternate one zero, double alternate one zero, 2^{23}-1, 2^{20}-1, 2^{15}-1, 2^{11}-1, 2^{9}-1, 1 in 8, 1 in 24, DDS1, DDS2, DDS3, DDS4, and DDS5.

Upgrading SRM-3T3 to SRME/B

The functionality of the SRME/B card is the same as the functionality of the SRM-3T3 card. Upgrading a shelf containing SRM-3T3 cards to one containing SRME/B cards first involves a software upgrade to 1.3.00 (or later) for PXM1 and 5.0 (or later) for PXM1E and PXM45. After upgrading the firmware image, you can replace the cards by either a graceful and non-graceful method.

Non-graceful Upgrade

A non-graceful upgrade involves removing one or both SRM-3T3 cards in a chassis bay and plugging in the SRME/B card(s); where the SRM-3T3 configuration is retained. A non-graceful upgrade will cause traffic outage during the upgrade time.

Graceful Upgrade

A graceful upgrade involves first replacing the standby SRM-3T3 card with an SRME/B card. After the SRME/B card becomes *standby*, then you must perform a switchover using the **switchcc** command on the standby card so that it takes over as *active*. After the card switchover, you can replace the current standby SRM-3T3 card with the SRME/B card. This will cause traffic outage only during the switchover time. Configuration changes are allowed when SRM-3T3 and SRME/B cards are paired and are working in a co-exist mode.

Note If, prior to this upgrade, the SRM-3T3 cards were configured for line parameter options not supported by the SRME/B card, the configuration options are restored to the default options supported by the SRME/B card and a message is logged in the event log.

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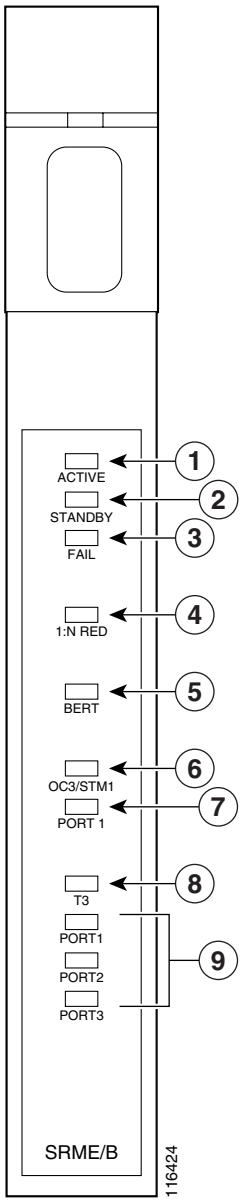
Figure 2-35 shows an SRME/B faceplate.

Figure 2-35 SRME/B Faceplate



1	ACTIVE LED	**6**	OC3/STM1 LED
2	STANDBY LED	**7**	PORT 1 LED
3	FAIL LED	**8**	T3 LED
4	1:N Redundancy LED (1:N RED)	**9**	PORT 1 through PORT 3 LEDs
5	BERT LED		

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VISM-PR

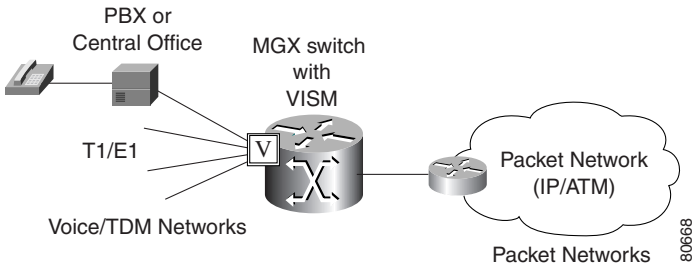
Supported models: MGX 8850 (PXM1E/PXM45), MGX 8850/B (PXM1E/PXM45), MGX 8880

The VISM-PR, in combination with a Cisco MGX switch, enables telephone calls on conventional time-division multiplexed (TDM) voice circuits to be transported over ATM packet-switched and VoIP networks.

The VISM-PRs provide toll-quality voice, fax, and modem transmission and efficient utilization of wide-area bandwidth through industry standard implementations of echo cancellation, voice-compression, and silence-suppression techniques.

The VISM-PR and Cisco MGX switch combination provides an interface, or voice gateway, between conventional TDM networks and packet-switched networks (see Figure 2-36).

Figure 2-36 MGX 8850 and VISM as a Voice Gateway



The switch connects to the packet network through use of the switch's processor switching modules (PXM45 or PXM1E). The processor switching modules communicate with a VISM-PR through the switch midplane cell bus.

When the VISM-PR is combined with a back card, a card set is created. Table 2-32 provides information about each VISM-PR, interface, and corresponding back card.

Table 2-32 VISM-PRs, Interfaces, and Supported Back Cards

VISM-PR	Interface Connections	Number of Lines Supported	Types of Lines Supported	Supported Back Cards
VISM-PR-8E1	Trunk	Up to 8	E1 TDM	• MGX-RJ48-8E1 (for use in Australia) • RJ48-8E1 • R-RJ48-8E1 • SMB-8E1 • R-SMB-8E1
VISM-PR-8T1	Trunk	Up to 8	T1 TDM	• RJ48-8T1 • R-RJ48-8T1

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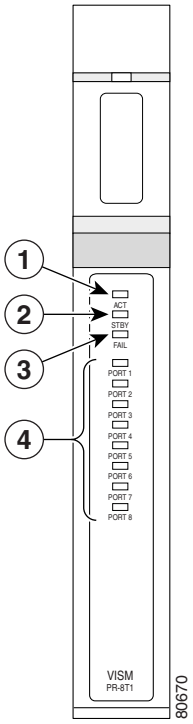
Note For information on VISM-PR software features and configurations, refer to the *Cisco Voice Interworking Services (VISM) Configuration Guide and Command Reference, Release 3.3*. For technical specifications for the VISM-PRs, see the "Single-Height Service Module Specifications" section on page A-2.

Faceplate Features

Figure 2-37 shows a VISM-PR faceplate. The only difference between the VISM-PR-8E1 and the VISM-PR-8T1 faceplates is the product name silk-screened on the front of each faceplate.

Figure 2-37 VISM-PR Faceplate



1	Active LED (ACT)	**3**	FAIL LED
2	Standby LED (STBY)	**4**	PORT 1 through PORT 8 LEDs

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Table 2-33 describes the LEDs on the VISM-PRs.

Table 2-33 VISM-PR LEDs

LED	Status	Description
ACT	Green	The VISM-PR card set (front card and back card) is in active state.
STBY	Yellow or blinking yellow	One of the following conditions exists: • The VISM-PR is in Standby mode. • The VISM-PR is in mismatch state. • The VISM-PR DSPs are currently involved in the VISM-PR bootup process.
FAIL	Red	When this LED is solid red and the ACT and STBY LEDs are off, one of the following conditions exists: • The module is in Reset mode. • The module has failed. • The card set is not complete (no back card).
PORT 1 through PORT 8	Green	The port is active with no alarms detected.
	Red	The port is active and a local alarm has been detected (LOS, LOF, or AIS). **Note** LOS is loss of signal; LOF is loss of frame; AIS is alarm indication signal.
	Yellow	The port is active and a remote alarm has been detected.
	Off	The port is not configured, or the card set is configured as a redundant card set and is in Standby mode.

Module Configurations

The VISM-PR supports the following module configurations:

- Standalone.
- 1:N card set redundancy, without bulk distribution
- 1:N card set redundancy, with bulk distribution—For line redundancy to be supported in this configuration, there must be redundant PXM1Es and redundant SRME cards. The APS connector must be installed between the SRME cards.
- Bulk distribution.

Note For module configuration information, refer to Chapter 4, “Planning for Card Redundancy, Line Redundancy, and Bulk Distribution”.

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VXSM

Supported models: MGX 8850 (PXM45), MGX 8850/B (PXM45), MGX 8880

The VXSM is Cisco's next generation voice switch service module. When installed in an MGX 8850 or MGX 8880 Media Gateway, the VXSM enables telephone calls on conventional time-division multiplexed (TDM) circuits to be transmitted across IP or ATM networks.

Physically, a VXSM card set consists of a double-height front card and a single-height back card (or cards). The front card includes a large daughter card on which the digital signal processors (DSPs) are installed. The front card and daughter card are installed as a single assembly and require only one slot. The complement of cards is as follows.

Front Cards

Two types of front card are supported:

- MGX-VXSM-155—A double-height card used with OC3 back card ports.
- MGX-VXSM-T1E1—A double-height card used with T1/E1 back card ports.
- MGX-VXSM-T3—A double-height card used with T3 back card ports.

Note that the VXSM front cards were renamed between MGX release 5.0.00 and 5.0.10:

- MGX-VXSM-4-155 became MGX-VXSM-155
- MGX-VXSM-48-T1E1 became MGX-VXSM-T1E1

Note The VXSM front cards use a dual latch system—to install a card, you must first hold up the metal latch at the top of the card, then push down on the plastic latch.

Back Cards

The three types of back card are supported:

- VXSM-BC-4-155—A single-height card installed in the upper bay (for same card APS SONET line protection, a second back card can be installed in the lower bay). This card provides 4 OC-3 ports.
- VXSM-BC-24-T1E1—A single-height card. Two such cards are used as a pair. One card is installed in the upper bay and one in the lower bay, providing a total interface for 48 T1/E1 lines.
  - Each 24 T1/E1 back card is equipped with two 50-pin connectors, one for transmit signals and one for receive signals. T1 and E1 lines should be connected through customer-supplied patch panels. Examples are:

    Ortronics 24 Port Patch Panel - Part # 808-044990

    Ortronics 48 Port Patch Panel - Part # 808-045368
- VXSM-BC-3-T3—A single-height card. Two such cards can be used as a pair. One card is installed in the upper bay and one in the lower bay, providing a total interface for 6 T3 lines.
- VXSM-R-BC—This is a redundant back card (no lines).

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Note The RCON card (Redundancy Connector) is a small assembly that, when installed, attaches to the top and/or bottom of the rear shelves and spans slots 1 to 6. Back cards connect to the RCON which in turn connects to the mid-plane of the chassis. The RCON provides redundant paths for the back cards, and its use is described in the *Cisco Voice Switch Services (VXSM) Configuration and Command Reference Guide for MGX Switches, Release 5*.

VXSM cards can be installed in a MGX 8850, MGX 8850/B, or MGX 8880 chassis. The differences between these chassis are as follows.

- Physically the two chassis are card compatible, the same control and service module cards can be installed in either chassis. However, the MGX 8880 supports only those cards that are used in media gateway applications. These are PXM45/C, VXSM, AXSM, and RPM-XF cards.
- The MGX 8880 chassis is smaller in height than the MGX 8850 or MGX 8850/B. Three MGX 8880 chassis can be installed in a 7-foot rack (as opposed to two for the MGX 8850 or MGX 8850/B).
- An RCON card is an integral part of the MGX 8880 chassis.
- The MGX 8850 has no RCON support. The MGX 8850/B chassis has optional RCON(s).

The pin assignments on the VXSM-BC-24-T1E1 back cards are as shown in Table 2-34 and Table 2-35.

Table 2-34 Transmit Pin to Signal Assignments

Pin	Signal	Signal	Pin
1	TXRING1	TXTIP1	26
2	TXRING2	TXTIP2	27
3	TXRING3	TXTIP3	28
4	TXRING4	TXTIP4	29
5	TXRING5	TXTIP5	30
6	TXRING6	TXTIP6	31
7	TXRING7	TXTIP7	32
8	TXRING8	TXTIP8	33
9	TXRING9	TXTIP9	34
10	TXRING10	TXTIP10	35
11	TXRING11	TXTIP11	36
12	TXRING12	TXTIP12	37
13	TXRING13	TXTIP13	38
14	TXRING14	TXTIP14	39
15	TXRING15	TXTIP15	40
16	TXRING16	TXTIP16	41
17	TXRING17	TXTIP17	42
18	TXRING18	TXTIP18	43
19	TXRING19	TXTIP19	44
20	TXRING20	TXTIP20	45
21	TXRING21	TXTIP21	46

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Table 2-34 Transmit Pin to Signal Assignments (continued)

Pin	Signal	Signal	Pin
22	TXRING22	TXTIP22	47
23	TXRING23	TXTIP23	48
24	TXRING24	TXTIP24	49
25			50

Table 2-35 Receive Pin to Signal Assignments

Pin	Signal	Signal	Pin
1	RXRING1	RXTIP1	26
2	RXRING2	RXTIP2	27
3	RXRING3	RXTIP3	28
4	RXRING4	RXTIP4	29
5	RXRING5	RXTIP5	30
6	RXRING6	RXTIP6	31
7	RXRING7	RXTIP7	32
8	RXRING8	RXTIP8	33
9	RXRING9	RXTIP9	34
10	RXRING10	RXTIP10	35
11	RXRING11	RXTIP11	36
12	RXRING12	RXTIP12	37
13	RXRING13	RXTIP13	38
14	RXRING14	RXTIP14	39
15	RXRING15	RXTIP15	40
16	RXRING16	RXTIP16	41
17	RXRING17	RXTIP17	42
18	RXRING18	RXTIP18	43
19	RXRING19	RXTIP19	44
20	RXRING20	RXTIP20	45
21	RXRING21	RXTIP21	46
22	RXRING22	RXTIP22	47
23	RXRING23	RXTIP23	48
24	RXRING24	RXTIP24	49
25			50

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Card Slots

In an MGX 8880 chassis or an MGX 8850 chassis VXSM cards can be installed in slots 1 through 6 and 9 through 14. Slots 7 and 8 are reserved for PXM45/C cards and slots 15 and 16 are reserved for SRME and SRME/B cards. These twelve slots (1 through 6 and 9 through 14) are available for VXSM cards. However, installed AXSM and/or RPM-XF cards also share these slots.

Slots 15 and 16 are reserved for SRME and SRME/B cards. These cards are typically not used in a Media Gateway application, and the slots must be left empty.

When 1:1 redundant VXSM front cards are configured, the redundant pair must be installed in adjacent slots (for example, slots 1 and 2 or slots 9 and 10).

Note MGX 8850 (PXM45) switches are *not* shipped from the factory with VXSM cards installed.

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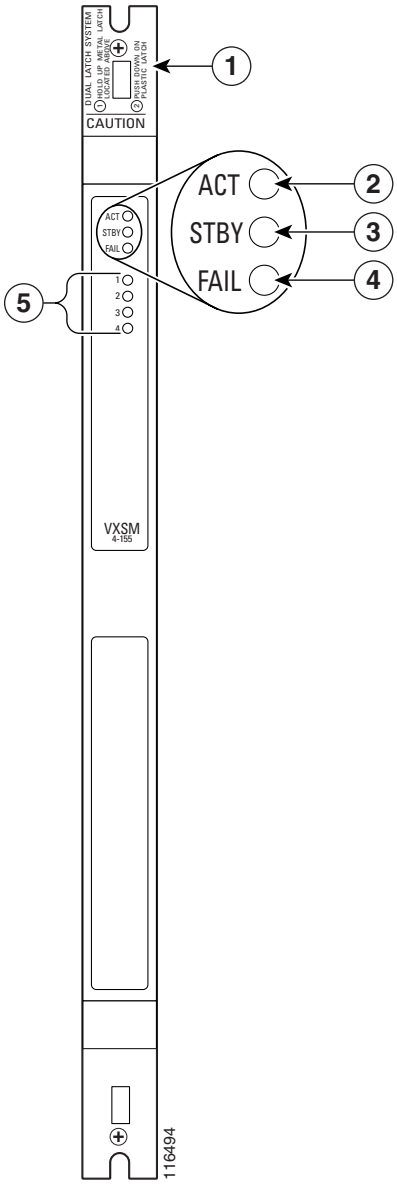
Faceplate Features

Figure 2-38 shows the VXSM-155 faceplate

Figure 2-38 VXSM-155 Faceplate



1	Instructions for DUAL LATCH SYSTEM: *1. Hold up metal latch located above.* *2. Push down on plastic latch.*	**4**	FAIL LED
2	Active LED (ACT)	**5**	Port x LEDs (4)
3	Standby LED (STBY)		

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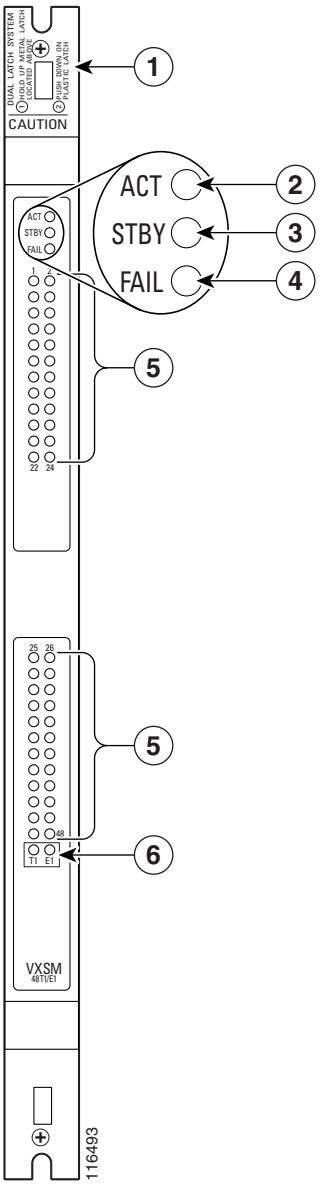
Figure 2-37 shows the VXSM-T1E1 faceplate.

Figure 2-39 VXSM-T1E1 Faceplate



1	Instructions for DUAL LATCH SYSTEM: *1. Hold up metal latch located above.* *2. Push down on plastic latch.*	**4**	FAIL LED
2	Active LED (ACT)	**5**	PORT LEDs (1 through 48)
3	Standby LED (STBY)	**6**	T1 or E1 LED

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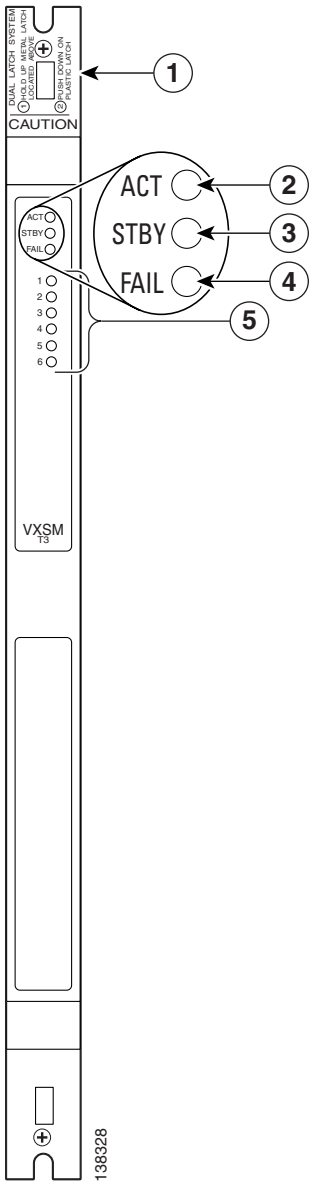
Figure 2-40 shows the VXSM-T3 faceplate

Figure 2-40 VXSM-T3 Faceplate



1	Instructions for DUAL LATCH SYSTEM: *1. Hold up metal latch located above.* *2. Push down on plastic latch.*	**4**	FAIL LED
2	Active LED (ACT)	**5**	Port x LEDs (6)
3	Standby LED (STBY)		

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Table 2-36 describes the LEDs on the VXSM front cards.

Table 2-36 VXSM Front Card LEDs

LED	Status	Description
ACT	Green	The VXSM card set (front card and back card) is in the active state.
STBY	Yellow or blinking yellow	One of the following conditions exists: • The VXSM is in Standby mode. • The VXSM is in mismatch state. • The VXSM DSPs are currently involved in the bootup process.
FAIL	Red	When this LED is solid red and the ACT and STBY LEDs are off, one of the following conditions exists: • The module is in Reset mode. • The module has failed. • The card set is not complete (no back card).
PORT 1 through PORT 24	Green	The port is active with no alarms detected.
	Red	The port is active and a local alarm has been detected (LOS, LOF, or AIS). **Note** LOS is loss of signal; LOF is loss of frame; AIS is alarm indication signal.
	Yellow	The port is active and a remote alarm has been detected.
	Off	The port is not configured, or the card set is configured as a redundant card set and is in Standby mode.

Module Configurations

The VXSM supports the following module configurations:

- Standalone.
- 1:N card set redundancy, without bulk distribution
- 1:N card set redundancy, with bulk distribution—For line redundancy to be supported in this configuration, there must be redundant PXM45 cards and redundant SRME/B cards. The APS connector must be installed between the SRME cards.
- Bulk distribution.

Note For module configuration information, refer to Chapter 4, "Planning for Card Redundancy, Line Redundancy, and Bulk Distribution".

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VXSM OC-3/STM-1 Interface

VXSM OC-3/STM-1 back cards (part VXSM-BC-4-155) use the Cisco industry-standard Small Form-Factor Pluggable (SFP) modules. SFPs minimize operations and sparing costs by allowing VXSM OC-3/STM-1 back cards to be easily adapted to various types of optical interfaces. For example, a VXSM OC-3/STM-1 back card with Multi-Mode Fiber (MMF) interfaces can be quickly changed to Single-Mode Fiber (SMF) by removing the MMF modules and inserting SMF modules. Table 2-37 provides information about the VXSM OC-3/STM-1 back card interfaces.

Table 2-37 VXSM OC-3/STM-1 Back Card Interfaces (Part VXSM-BC-4-155)

	MMF	SMF Intermediate Reach (SMF-IR)	SMF Long Reach (SMF-LR)
Port speed	155 Mbps	155 Mbps	155 Mbps
Maximum number of ports	4	4	4
Port media	MMF	SMF	SMF
Port connector	LC	LC	LC
Optics	LED 1310 nm	LED 1310 nm	LED 1310 nm
Tx power level (dBm)	–19 min –14 max	–15 min –8 max	5 min 0 max
Rx power level (dBm)	–30 min –14 max	–28 min –8 max	–34 min –10 max
Typical reach (km)	2	15	40
Redundancy	1:1	1:1	1:1
Line protection	APS 1+1	APS 1+1	APS 1+1

VXSM T1/E1 Interface

The VXSM T1/E1 back card (part VXSM-BC-24-T1E1) supports up to 48 ports. The VXSM T1/E1 back cards are deployed in pairs; each supporting 24 T1/E1 ports. Table 2-38 provides information about the VXSM OC-3/STM-1 back card interfaces.

Table 2-38 VXSM T1E1 Back Card Interfaces (Part VXSM-BC-24T1E1)

Parameter	T1	E1
Port speed	1.544 Mbps	2.048 Mbps
Maximum number of ports per back card	24	24
Port media	100-ohm twisted pair	120-ohm twisted pair
Port connector	50-pin Amphenol	50-pin Amphenol
Line coding	Binary 8-zero substitution (B8ZS) or alternate mark inversion (AMI)	HDB3 or AMI
Line framing	ANSI T1.408 Extended Superframe, Super Frame format line framing	ITU-T G.704 basic frame, multiframe, cyclic redundancy check (CRC) framing
Redundancy	1:1	1:1

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Note For information on VXSM software features and configurations, refer to the *Cisco Voice Switch Services (VXSM) Configuration and Command Reference Guide for MGX Switches, Release 5*. For technical specifications for the VXSM cards, see the "Double-Height Service Module Specifications" section on page A-2.

VXSM T3 Interface

The VXSM T3 back card (part VXSM-BC-6-T3) supports up to 6 ports. The VXSM T3 back cards are deployed in pairs; each supporting 3 T3 ports. Table 2-39 provides information about the VXSM T3 back card interfaces.

Table 2-39 VXSM T3 Back Card Interfaces (Part VXSM-BC-3T3)

Parameter	T3
Port speed	44.736 Mbps
Maximum number of ports per back card	3
Port media	75-ohm coaxial cable
Port connector	SMB
Line coding	Binary 3-zero substitution (B3ZS)
Redundancy	1:1

Note For information on VXSM software features and configurations, refer to the *Cisco Voice Switch Services (VXSM) Configuration and Command Reference Guide for MGX Switches, Release 5*. For technical specifications for the VXSM cards, see the "Double-Height Service Module Specifications" section on page A-2.

XM60

Supported models: MGX 8950

The XM60 is the switch fabric that powers the MGX 8950 switch. Up to four XM60s can be installed in the MGX 8950 switch to provide 240 Gbps of switching capacity for the system. All four XM60s should be installed to provide scalable bandwidth sharing and for full redundancy. (Operation with one or two XM60 cards is not supported.)

The switch scheduling hardware optimizes switching throughput by adjusting to various traffic flows. A single point of failure in the switch fabric does not block traffic flow in a system with multiple switch modules. During normal operations, all installed XM60s can participate in cell switching to enable maximum hardware usage and reliability.

Note The XM60s do not have corresponding back cards.

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The XM60 provides the following features:

- Support for 60, 120, 180, or 240 Gbps of cross-point switching capacity
- Dynamic sharing of capacity across multiple XM60s, allowing for 3:1 redundancy
- Data forwarding capabilities in the event of a control processor failure, since the switching module is separate from the control processor
- An aggregate bandwidth of 10 Gbps per slot
- Four switch ASICs and four serial links to each AXSM slot (one serial link per switch ASIC)
- Two serial links to PXM45 cards from the upper two XM60s (slots 9 and 10)

The XM60 performs the following functions:

- Extracts in-band requests from the AXSM cards and PXM45 cards
- Schedules and grants access to the AXSM cards and PXM45 cards
- Performs spatial multicast functions to the egress slots
- Provides counters for error statistics on a per serial link basis
- Provides an interface to the CPU on the PXM45 cards for statistic collections

Note The MGX 8950 switch and XM60 card require PXM45/B or PXM45/C cards.

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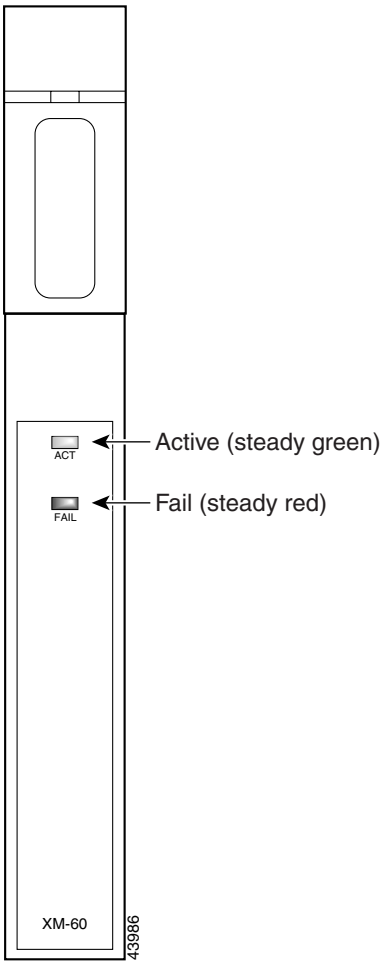
Faceplate Features

Figure 2-41 shows the XM60 faceplate.

Figure 2-41 XM60 Faceplate



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Back Cards

Back Cards for MGX 8850 (PXM1E/PXM45) or MGX 8850 (PXM1E/PXM45) Switches

Table 2-40 provides information about each back card in an MGX 8850 (PXM1E/PXM45) or MGX 8850/B (PXM1E/PXM45) switches.

See Table 1-3 for information about front card and back card compatibility in the MGX 8850 (PXM1E/PXM45) or MGX 8850/B (PXM1E/PXM45) switches, respectively.

Table 2-40 Back Card Information for MGX 8850 (PXM1E/PXM45) or MGX 8850/B (PXM1E/PXM45) Switches

Name Printed on the Faceplate	Cisco Product ID
12IN1-8S, page 2-98	MGX-12IN1-8S
BNC-2T3, page 2-100	MGX-BNC-2T3
BNC-3T3-M, page 2-102	MGX-BNC-3T3-M
MCC-8-155, page 2-103	MCC-8-155
MCC-16-E1, page 2-104	MCC-16-E1
MCC-16-E1-1N, page 2-104	MCC-16-E1-1N
MGX-1GE, page 2-106	MGX-1GE
MGX-2GE, page 2-108	MGX-2GE
MGX-1OC12POS-IR, page 2-109	MGX-1OC12POS-IR
MGX-2OC12POS-IR, page 2-110	MGX-2OC12POS-IR
MGX-RJ45-5-ETH, page 2-111	MGX-RJ45-5-ETH
MGX-XF-UI, page 2-113	MGX-RJ48-8E1
MGX-XF-UI, page 2-113	MGX-XF-UI
MMF-4-155/C, page 2-116	MMF-4-155/C
MMF-8-155-MT and MMF-8-155-MT/B, page 2-117	MMF-8-155-MT and MMF-8-155-MT/B
MMF-FE, page 2-118	MGX-MMF-FE
PXM-HD, page 2-119	PXM-HD
PXM-UI-S3 and PXM-UI-S3/B, page 2-120	PXM-UI-S3 and PXM-UI-S3/B
RBBN-16-T1E1, page 2-123	RBBN-16-T1E1
RBBN-16-T1E1-1N, page 2-124	RBBN-16-T1E1-1N
RED-16-T1E1, page 2-120	RED-16-T1E1
RJ45-4E/B, page 2-127	MGX-RJ45-4E/B
RJ45-FE, page 2-128	MGX-RJ45-FE
RJ48-8E1 and R-RJ48-8E1, page 2-129	AX-RJ48-8E1 and AX-R-RJ48-8E1
RJ48-8T1 and R-RJ48-8T1, page 2-130	AX-RJ48-8T1 and AX-R-RJ48-8T1
SCSI2-2HSSI/B, page 2-131	MGX-SCSI2-2HSSI/B

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Table 2-40 Back Card Information for MGX 8850 (PXM1E/PXM45) or MGX 8850/B (PXM1E/PXM45) Switches (continued)

Name Printed on the Faceplate	Cisco Product ID
SFP-2-155, page 2-132	SFP-8-155
SMB-2-155-EL, page 2-136	SMB-4-155
SMB-6-T3E3, page 2-138	SMB-6-T3E3
SMB-8E1 and R-SMB-8E1, page 2-139	AX-SMB-8E1 and AX-R-SMB-8E1
SMB-8E3, page 2-140	SMB-8E3
SMB-8T3, page 2-141	SMB-8T3
SMFIR-1-155, page 2-142	MGX-SMFIR-1-155
SMFIR-1-622/C, page 2-143	MGX-SMFIR-1-622/C
SMFIR-2-622 and SMFIR-2-622/B, page 2-144	SMFIR-2-622 and SMFIR-2-622/B
SMFIR-4-155/C, page 2-145	MGX-SMFIR-4-155/C
SMFIR-8-155-LC and SMFIR-8-155-LC/B, page 2-146	SMFIR-8-155-LC and SMFIR-8-155-LC/B
SMFLR-1-2488 and SMFLR-1-2488/B, page 2-147	SMFLR-1-2488 and SMFLR-1-2488/B
SMFLR-1-622/C, page 2-148	SMFLR-1-622/C
SMFLR-2-622 and SMFLR-2-622/B, page 2-149	SMFLR-2-622 and SMFLR-2-622/B
SMFLR-4-155/C, page 2-150	SMFLR-4-155/C
SMFLR-8-155-LC and SMFLR-8-155-LC/B, page 2-151	SMFLR-8-155-LC and SMFLR-8-155-LC/B
SMFSR-1-2488 and SMFSR-1-2488/B, page 2-152	SMFSR-1-2488 and SMFSR-1-2488/B
SMFXLR-1-2488 and SMFXLR-1-2488/B, page 2-154	SMFXLR-1-2488 and SMFXLR-1-2488/B
STM1-EL-1, page 2-155	MGX-STM1-EL-1
T3E3-155, page 2-156	MGX-T3E3-155
VXSM-BC-4-155, page 2-158[1]	VXSM-BC-4-155
VXSM-BC-24-T1E1, page 2-159[1]	VXSM-BC-24-T1E1
VXSM-R-BC, page 2-160[1]	VXSM-BC-3T3
VXSM-R-BC, page 2-160[1]	VXSM-R-BC

1. MGX 8850 (PXM45) only.

Back Cards for MGX 8950 Switches

Table 2-41 provides information about each back card in an MGX 8950 switch. See Table 1-3 for information about front card and back card compatibility.

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Table 2-41 Back Card Information for the MGX 8950 Switch

Back Card	
Name Printed on the Faceplate	**Cisco Product ID**
MCC-8-155, page 2-103	MCC-8-155
MGX-1GE, page 2-106	MGX-1GE
MGX-1OC12POS-IR, page 2-109	MGX-1OC12POS-IR
MGX-RJ45-5-ETH, page 2-111	MGX-RJ45-5-ETH
MGX-XF-UI, page 2-113	MGX-XF-UI
MMF-8-155-MT/B (See MMF-8-155-MT and MMF-8-155-MT/B, page 2-117)	MMF-8-155-MT/B
MMF-FE, page 2-118	MGX-MMF-FE
PXM-HD, page 2-119	PXM-HD
PXM-UI-S3 and PXM-UI-S3/B, page 2-120	PXM-UI-S3
RJ45-4E/B, page 2-127	MGX-RJ45-4E/B
RJ45-FE, page 2-128	MGX-RJ45-FE
SFP-2-155, page 2-132	SFP-2-155
SMB-2-155-EL, page 2-136	SMB-4-155
SMB-8E3, page 2-140	SMB-8E3
SMB-8T3, page 2-141	SMB-8T3
SMFIR-1-155, page 2-142	SMFIR-1-155
SMFIR-2-622/B (See SMFIR-2-622 and SMFIR-2-622/B, page 2-144)	SMFIR-2-622/B
SMFIR-8-155-LC/B (See SMFIR-8-155-LC and SMFIR-8-155-LC/B, page 2-146)	SMFIR-8-155-LC/B
SMFLR-1-2488/B (See SMFLR-1-2488 and SMFLR-1-2488/B, page 2-147)	SMFLR-1-2488/B
SMFSR-1-9953, page 2-153	SMFSR-1-9953
SMFLR-2-622/B (See SMFLR-2-622 and SMFLR-2-622/B, page 2-149)	SMFLR-2-622/B
SMFLR-8-155-LC/B (See SMFLR-8-155-LC and SMFLR-8-155-LC/B, page 2-151)	SMFLR-8-155-LC/B
SMFSR-1-2488/B (See SMFSR-1-2488 and SMFSR-1-2488/B, page 2-152)	SMFSR-1-2488/B
SMFXLR-1-2488/B (See SMFXLR-1-2488 and SMFXLR-1-2488/B, page 2-154)	SMFXLR-1-2488/B

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Back Cards for MGX 8830 Switches

Table 2-42 provides information about each back card in the MGX 8830 or MGX 8830/B switch. See Table 1-3 for information about front card and back card compatibility.

Table 2-42 Back Card Information for the MGX 8830 or MGX 8830/B Switch

Back Card	
Name Printed on the Faceplate	**Cisco Product ID**
12IN1-8S, page 2-98	MGX-12IN1-8S
BNC-2E3, page 2-99	MGX-BNC-2E3
BNC-2T3, page 2-100	MGX-BNC-2T3
BNC-3T3-M, page 2-102	MGX-BNC-3T3-M
MCC-8-155, page 2-103	MCC-8-155
MCC-16-E1, page 2-104	MCC-16-E1
MCC-16-E1-1N, page 2-104	MCC-16-E1-1N
MGX-RJ45-5-ETH, page 2-111	MGX-RJ45-5-ETH
MGX-XF-UI, page 2-113	MGX-RJ48-8E1
MMF-4-155/C, page 2-116	MGX-MMF-4-155/C
MMF-FE, page 2-118	MGX-MMF-FE
PXM-UI-S3 and PXM-UI-S3/B, page 2-120	PXM-UI-S3 and PXM-UI-S3/B
RBBN-16-T1E1, page 2-123	RBBN-16-T1E1
RBBN-16-T1E1, page 2-123	RBBN-16-T1E1-1N
RED-16-T1E1, page 2-125	RED-16-T1E1
RJ45-4E/B, page 2-127	MGX-RJ45-4E/B
RJ45-FE, page 2-128	MGX-RJ45-FE
RJ48-8E1 and R-RJ48-8E1, page 2-129	AX-RJ48-8E1 and AX-R-RJ48-8E1
RJ48-8T1 and R-RJ48-8T1, page 2-130	AX-RJ48-8T1 and AX-R-RJ48-8T1
SCSI2-2HSSI/B, page 2-131	MGX-SCSI2-2HSSI/B
SFP-2-155, page 2-132	SFP-8-155
SMB-8E1 and R-SMB-8E1, page 2-139	AX-SMB-8E1 and AX-R-SMB-8E1
SMB-8E3, page 2-140	SMB-8E3
SMB-8T3, page 2-141	SMB-8T3
SMFIR-1-155, page 2-142	MGX-SMFIR-1-155
SMFIR-4-155/C, page 2-145	MGX-SMFIR-4-155/C
SMFLR-4-155/C, page 2-150	MGX-SMFLR-4-155/C
STM1-EL-1, page 2-155	MGX-STM1-EL-1
T3E3-155, page 2-156	MGX-T3E3-155

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Back Cards for MGX 8880 Media Gateway

Table 2-43 provides information about each back card in an MGX 8880 Media Gateway. See Table 1-3 for information about front card and back card compatibility in the MGX 8880 gateway.

Table 2-43 Back Card Information for the MGX 8880 Media Gateway

Name Printed on the Faceplate	Cisco Product ID
BNC-3T3-M, page 2-102	MGX-BNC-3T3-M
MCC-16-E1, page 2-104	MCC-16-E1
MCC-8-155, page 2-103	MCC-8-155
MGX-1GE, page 2-106 (with transceiver)	MGX-1GE
MGX-1OC12POS-IR, page 2-109	MGX-1OC12POS-IR
MGX-RJ45-5-ETH, page 2-111	MGX-RJ45-5-ETH
MGX-XF-UI, page 2-113	MGX-XF-UI
MGX-XF-UI/B, page 2-114	MGX-XF-UI/B
MMF-4-155/C, page 2-116	MMF-4-155-MT/C
MMF-8-155-MT and MMF-8-155-MT/B, page 2-117	MMF-8-155-MT and MMF-8-155-MT/B
PXM-HD, page 2-119	PXM-HD
PXM-UI-S3 and PXM-UI-S3/B, page 2-120	PXM-UI-S3 and PXM-UI-S3/B
RBBN-16-T1E1, page 2-123	RBBN-16-T1E1
RBBN-16-T1E1-1N, page 2-124	RBBN-16-T1E1-1N
RJ48-8E1 and R-RJ48-8E1, page 2-129	AX-RJ48-8E1 and AX-R-RJ48-8E1
RJ48-8T1 and R-RJ48-8T1, page 2-130	AX-RJ48-8T1 and AX-R-RJ48-8T1
SMB-4-155, page 2-137	SMB-4-155
SMB-8E1 and R-SMB-8E1, page 2-139	AX-SMB-8E1 and AX-R-SMB-8E1
SMB-8E3, page 2-140	SMB-8E3
SMB-8T3, page 2-141	SMB-8T3
SMFIR-1-155, page 2-142	MGX-SMFIR-1-155
SMFIR-1-622/C, page 2-143	MGX-SMFIR-1-622/C
SMFIR-2-622 and SMFIR-2-622/B, page 2-144	SMFIR-2-622 and SMFIR-2-622/B
SMFIR-4-155-LC/B from SMFIR-4-155/C, page 2-145	SMFIR-4-155/C
SMFIR-8-155-LC/B from SMFIR-8-155-LC and SMFIR-8-155-LC/B, page 2-146	SMFIR-8-155-LC and SMFIR-8-155-LC/B
SMFLR-1-2488/B from SMFLR-1-2488 and SMFLR-1-2488/B, page 2-147	SMFLR-1-2488 and SMFLR-1-2488/B
SMFLR-1-622/C, page 2-148	SMFLR-1-622/C
SMFLR-2-622/B from SMFLR-2-622 and SMFLR-2-622/B, page 2-149	SMFLR-2-622 and SMFLR-2-622/B
SMFLR-4-155-LC/B from SMFLR-4-155/C, page 2-150	SMFLR-4-155-LC/B

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Table 2-43 Back Card Information for the MGX 8880 Media Gateway (continued)

Name Printed on the Faceplate	Cisco Product ID
SMFLR-8-155-LC/B from SMFLR-8-155-LC and SMFLR-8-155-LC/B, page 2-151	SMFLR-8-155-LC and SMFLR-8-155-LC/B
SMFSR-1-2488/B from SMFSR-1-2488 and SMFSR-1-2488/B, page 2-152	SMFSR-1-2488 and SMFSR-1-2488/B
SMFXLR-1-2488 and SMFXLR-1-2488/B, page 2-154	SMFXLR-1-2488 and SMFXLR-1-2488/B
STM1-EL-1, page 2-155	MGX-STM1-EL-1
VXSM-BC-24-T1E1, page 2-159	VXSM-BC-24-T1E1
VXSM-BC-4-155, page 2-158	VXSM-BC-4-155
VXSM-BC-4-155, page 2-158	VXSM-BC-4-155
VXSM-BC-3T3, page 2-160	VXSM-BC-3-T3
VXSM-R-BC, page 2-160	VXSM-R-BC

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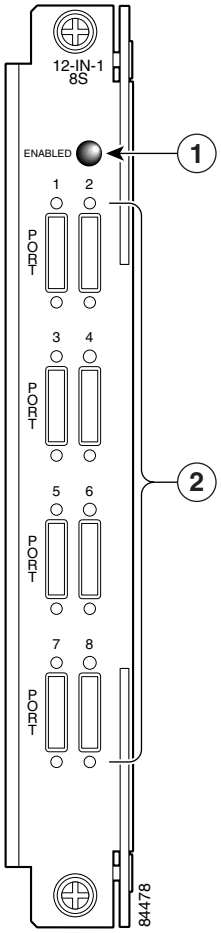
12IN1-8S

The 12IN1-8S is an eight-port back card that provides V.35 and X.21 (V.11) serial interfaces. Figure 2-42 shows the 12IN1-8S faceplate.

Figure 2-42 12IN1-8S Faceplate



1	ENABLED LED • Green—The back card is active. • Off—The back card is not active.	**2**	Small serial connectors for PORT 1 through PORT 8

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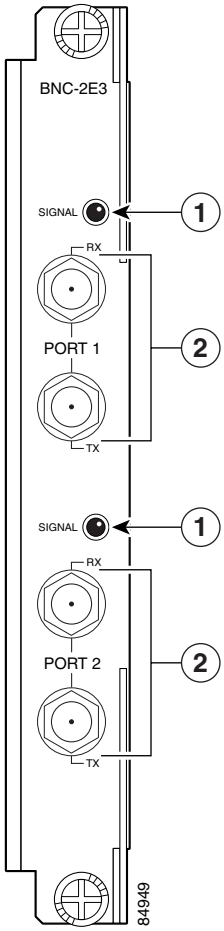
BNC-2E3

The BNC-2E3 is a two-port back card that provides E3 interfaces. Figure 2-43 shows the BNC-2E3 faceplate. The BNC-2E3A faceplate for Australia is different (not shown). **Cables**: **CAB-BNC-Y, CAB-BNC-Y/B**.

Figure 2-43 BNC-2E3 Faceplate



1	SIGNAL LED • Green—The back card is receiving a signal on the corresponding line.	**2**	RX and TX BNC female connectors for PORT 1 and PORT 2

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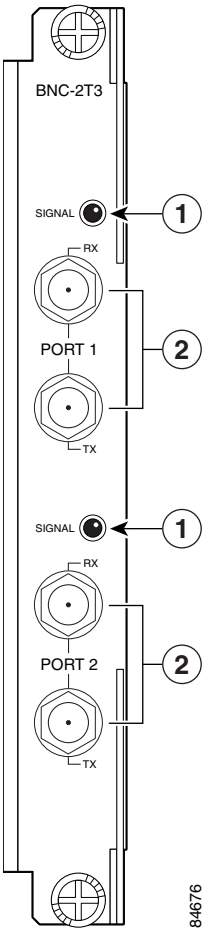
BNC-2T3

The BNC-2T3 is a two-port back card that provides T3 interfaces. Figure 2-44 shows the BNC-2T3 faceplate. **Cable: CAB-BNC-Y, CAB-BNC-Y/B.**

Figure 2-44 BNC-2T3 Faceplate



1	SIGNAL LED • Green—The back card is receiving a signal on the corresponding line.	**2**	RX and TX BNC female connectors for PORT 1 and PORT 2

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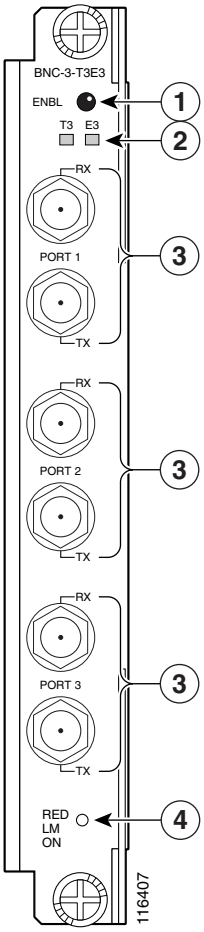
BNC-3-T3E3

The BNC-3-T3E3 back card provides three T3 interfaces. Figure 2-45 shows the BNC-3-T3E3 faceplate.
Cable: CAB-BNC-Y, CAB-BNC-Y/B.

Figure 2-45 BNC-3-T3E3 Faceplate



1	Enable (ENBL) LED	**3**	RX and TX BNC female connectors—PORT 1, 2, 3
2	T3 or E3 Mode LEDs	**4**	RED LM ON

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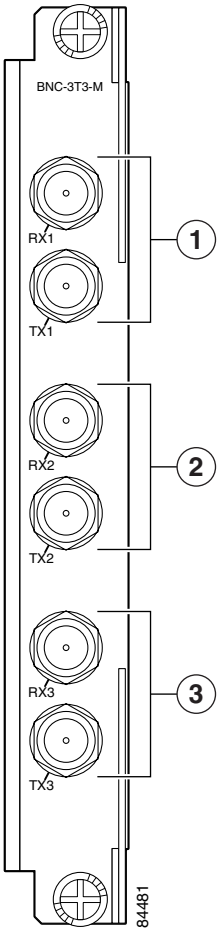
BNC-3T3-M

The BNC-3T3-M is a back card that provides three T3 interfaces. Figure 2-46 shows the BNC-3T3-M faceplate. **Cable: CAB-BNC-Y, CAB-BNC-Y/B.**

Figure 2-46 BNC-3T3-M Faceplate



1	RX and TX BNC female connectors—PORT 1	**3**	RX and TX BNC female connectors—PORT 3
2	RX and TX BNC female connectors—PORT 2		

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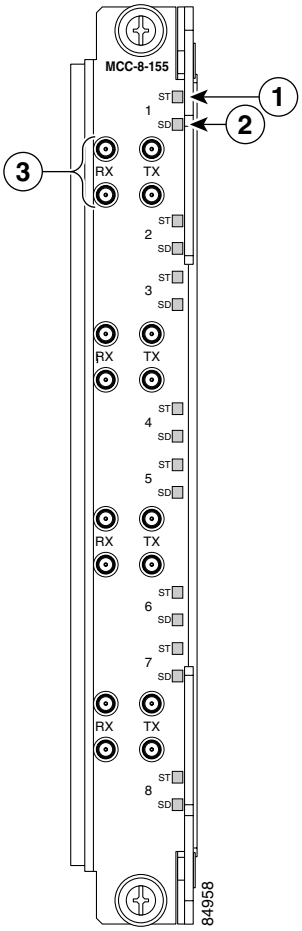
MCC-8-155

The MCC-8-155 is a back card that provides eight OC-3c interfaces using 16 MCC connectors (8 transmit and 8 receive). Figure 2-47 shows the MCC-8-155 faceplate. **Cables: CAB-MCC-T1E1 and CAB-MCC-T1E1-Y.**

Figure 2-47 MCC-8-155 Faceplate



1	ST LED (Status) • Green—port up • Blinking green—port down • Off—LED malfunction	**3**	RX and TX MCC connectors—PORT 1 through PORT 8
2	SD LED (Signal Detect) • Green—port up • Blinking green—port down • Off—LED malfunction		

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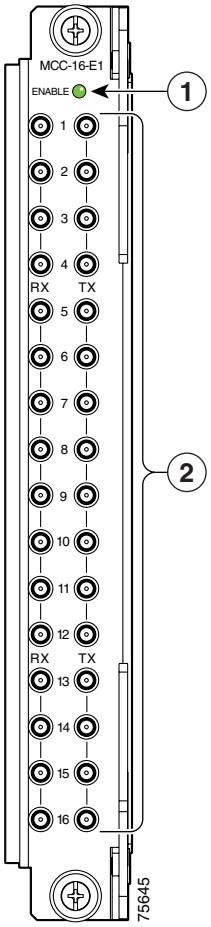
MCC-16-E1

The MCC-16-E1 is a back card that provides 16 E1 interfaces using 32 E1 MCC connectors (16 transmit and 16 receive). Figure 2-48 shows the MCC-16-E1 faceplate. **Cables: CAB-MCC-T1E1 and CAB-MCC-T1E1-Y.**

Figure 2-48 MCC-16-E1 Faceplate



1	ENABLE LED • Green—The back card is active. • Off—The back card is not active.	**2**	16 RX and 16 TX E1 MCC female connectors

MCC-16-E1-1N

The MCC-16-E1-1N is a back card that provides 16 E1 interfaces using 32 E1 MCC connectors (16 transmit and 16 receive). Figure 2-49 shows the MCC-16-E1-1N faceplate.

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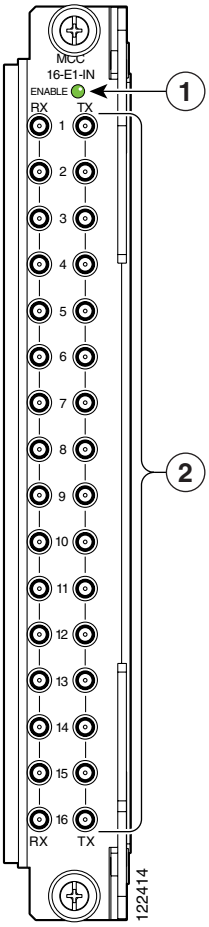
Supports 1:N redundancy in the following switches:

- MGX 8830/B (with RCON-1TO3-8830)
- MGX 8850/B (with RCON-1TO3-8850 or RCON-1TO5-8850)

Redundant back card is RED-16-T1E1.

Figure 2-49 MCC-16-E1-1N Faceplate



1	ENABLE LED • Green—The back card is active. • Off—The back card is not active.	**2**	16 RX and 16 TX E1 MCC female connectors

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MGX-1GE

The MGX-1GE is a single-port high-speed uplink (Gigabit Ethernet) back card. The MGX-1GE is installed in the upper rear bay back slot directly behind the RPM-XF.

The MGX-1GE uses SFP modules that support Gigabit Ethernet rates on SX, LH/LX, ZX and T Gigabit Ethernet interface types. The following table provides details for the modules that are supported on the MGX-1GE. The modules can be changed or upgraded.

SFP	Description	62.5/125 um Multimode 850 nmCable	50/125 um Multimode 850 nmCable	62.5/125 um Multimode 1310 nmCable	50/125 um Multimode 1310 nm Cable	9/125 um Singlemode 1310 nm Cable	Category 5 Cable
GLC-SX-MM	1000Base SX	220 M at 160 MHz-km 275 M at 200 MHz-km	500 M at 400 MHz-km 550 M at 500 MHz-km	—	—	—	—
GLC-LH-SM	1000Base LH/LX	—	—	550 M at 500 MHz-km	550 M at 400 MHz-km	10 km	—
GLC-ZX-SM	1000Base ZX	—	—	—	—	70 km	—
GLC-GE-T	1000BASE-T (Copper)	—	—	—	—	—	100M

Figure 2-50 shows the MGX-1GE faceplate.

Cables include: CAB-FIR-LC, CAB-MMF-LC, CAB-SMFLR-LC.

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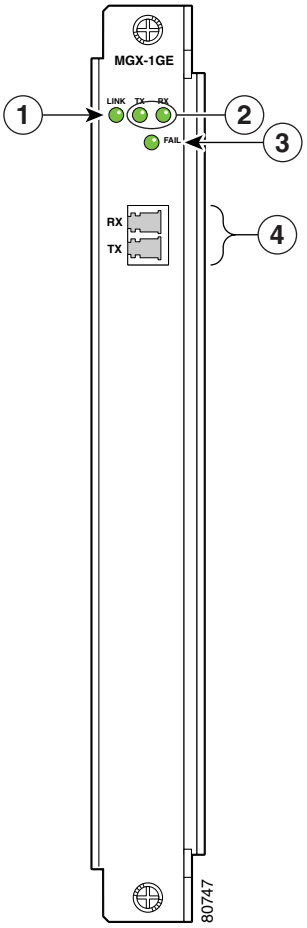
Figure 2-50 MGX-1GE Faceplate



1	LINK LED • Green—A link has been established. • Off—A link has not been established.	**3**	FAIL LED • Yellow—The back card has failed. • Off—The back card is operating properly.
2	TX and RX LEDs • Green—The back card is receiving or transmitting traffic. • Off—The back card is not receiving or transmitting traffic.	**4**	TX and RX LC connectors

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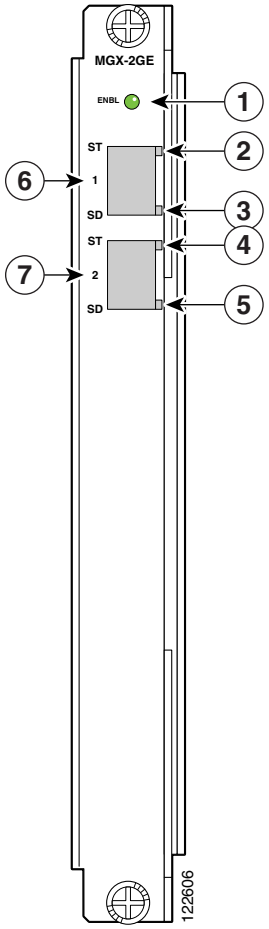
MGX-2GE

Figure 2-51 shows the MGX-2GE faceplate. The MGX-2GE card is a single-height, 2-port Gigabit Ethernet back card for RPM-XF module. **Cables: CAB-FIR-LC, CAB-MMF-LC, CAB-SMFLR-LC.**

Figure 2-51 MGX-2GE Faceplate



1	ENBL LED • Off—The back card is functioning. • Yellow—The back card has failed	**2**	Port 0 status LED • Green—The link is up. • Yellow—The link is down.
3	Port 0 signal detect LED • Green—A signal is present. • Green (flashing)—Loss of signal	**4**	Port 1 status LED • Green—The link is up. • Yellow—The link is down.
5	Port 1 signal detect LED • Green—A signal is present. Green (flashing)—Loss of signal	**6**	Port 0 SFP receptacle
7	Port 1 SFP receptacle		

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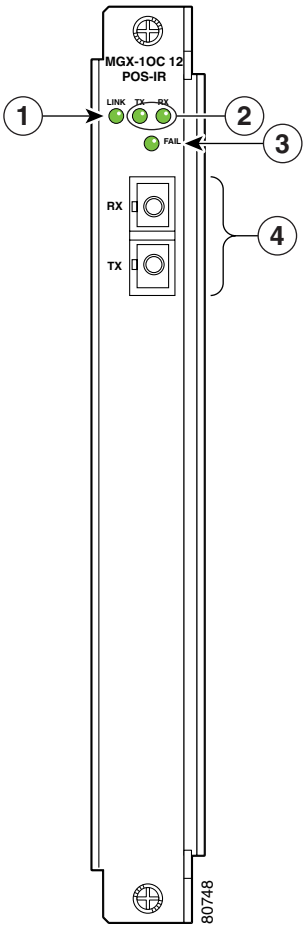
MGX-1OC12POS-IR

The MGX-1OC12POS-IR is a single-port high-speed uplink (OC-12 POS) back card. This back card provides a trunk uplink that supports OC-12c/STM-4c bandwidth of 622 Mbps throughput over a standard SONET/SDH interface through use of a single-mode fiber, intermediate reach SC connector. The MGX-1OC12POS-IR is installed in the upper rear bay back slot directly behind the RPM-XF. Figure 2-52 shows the MGX-1OC12POS-IR faceplate. **Cables: CAB-SMF-SC (several) and CAB-SMF-Y-SC.**

Figure 2-52 MGX-1OC12POS-IR Faceplate



1	LINK LED • Green—A link has been established. • Off—A link has not been established.	**3**	FAIL LED • Yellow—The back card has failed. • Off—The back card is operating properly.
2	TX and RX LEDs • Green—The back card is receiving or transmitting traffic. • Off—The back card is not receiving or transmitting traffic.	**4**	TX and RX SC connectors

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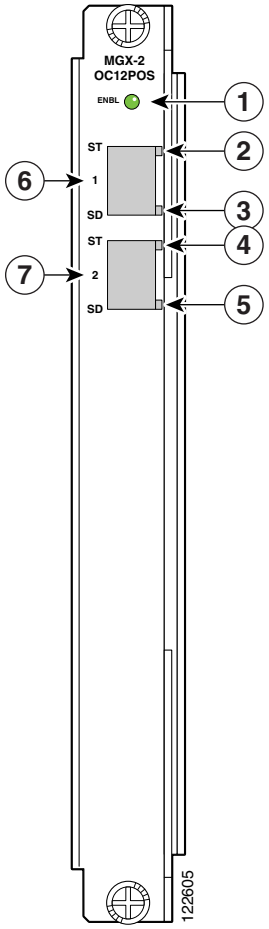
MGX-2OC12POS-IR

Figure 2-53 shows the MGX-2OC12POS-IR faceplate.

Figure 2-53 MGX-2OC12POS-IR Faceplate



1	ENBL LED • Off—The back card is functioning. • Yellow—The back card has failed	**2**	Port 0 status LED • Green—The link is up. • Yellow—The link is down.
3	Port 0 signal detect LED • Green—A signal is present. • Green (flashing)—Loss of signal	**4**	Port 1 status LED • Green—The link is up. • Yellow—The link is down.
5	Port 1 signal detect LED • Green—A signal is present. Green (flashing)—Loss of signal	**6**	Port 0 SFP receptacle
7	Port 1 SFP receptacle		

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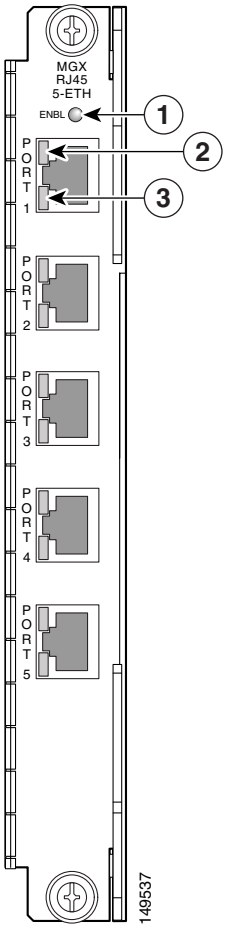
MGX-RJ45-5-ETH

The MGX-RJ45-5-ETH is a single-height back card for the RPM-PR that provides five RJ-45 connectors for Gigabit Ethernet, Fast Ethernet, or Ethernet lines. Figure 2-54 shows the MGX-RJ45-5-ETH faceplate.

Figure 2-54 MGX-RJ45-5-ETH Faceplate



1	ENABLE LED • Green—The back card is active. • Off—The back card is not active.	**3**	Port 0 status LED • Green—Data present (flashing). • Orange—The link is up.
2	Port 0 speed LED • Green—1000 Mbps. • Orange—10 Mbps or 100 Mbps.	**4**	

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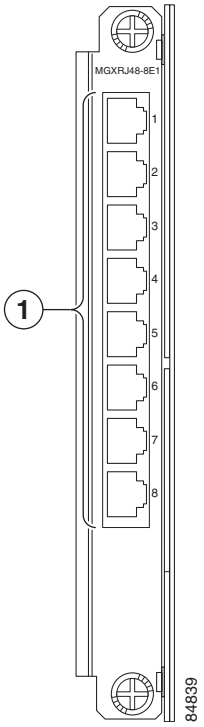
MGX-RJ48-8E1

The MGX-RJ48-8E1 is a single-height back card that provides eight RJ-48 connectors for E1 lines. Figure 2-55 shows the MGX-RJ48-8E1 faceplate.

Note This card is for use in Australia.

Figure 2-55 MGX-RJ48-8E1 Faceplate



1	Eight RJ-48 connectors for E1 lines		

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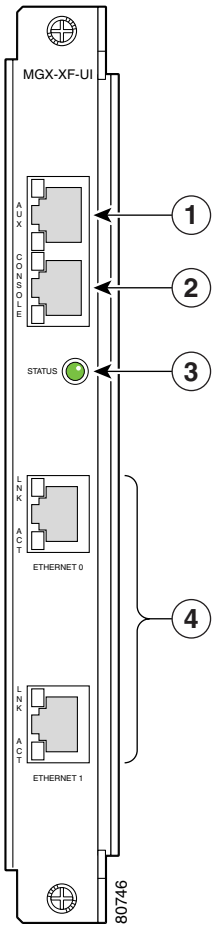
MGX-XF-UI

The MGX-XF-UI is a management back card that provides remote management capabilities for the RPM-XF through a console connection, an auxiliary connection, and two fast ethernet (FE) ports. The MGX-XF-UI is always installed in the lower rear bay back slot directly behind the RPM-XF. Figure 2-56 shows the MGX-XF-UI faceplate.

Figure 2-56 MGX-XF-UI Faceplate



1	AUX—An RJ-45 receptacle that provides connection to an auxiliary device that is used as an external terminal for local administrative access.	**3**	STATUS LED • Green—The back card is active. • Off—The back card is not detected or a major failure has disabled the back card.
2	CONSOLE—An RJ-45 receptacle that provides a serial connection used for an external terminal for local administrative access.	**4**	ETHERNET 0 AND ETHERNET 1—Two fast ethernet (FE) RJ-45 receptacles that comply with Ethernet standards and that are used to connect the RPM-XF to a 10/100BASE-T network management LAN.

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Note Connecting to the auxiliary port through a modem is not supported. The auxiliary port can operate at a user-specified baud rate (1200 to 9600 baud).

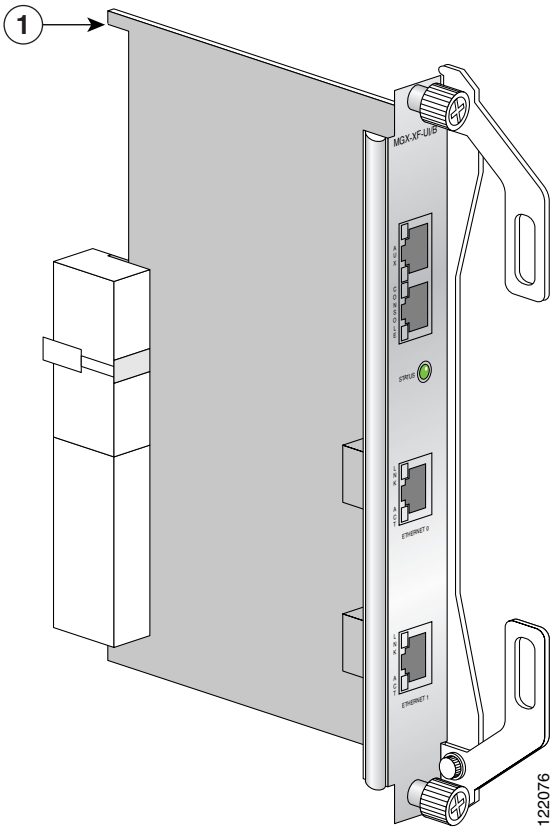
The console port can operate at a user-specified baud rate (1200 to 115200 baud). A console port speed rate of 9600 baud is recommended.

MGX-XF-UI/B

The MGX-XF-UI/B is a management back card that provides remote management capabilities for the RPM-XF through a console connection, an auxiliary connection, and two fast ethernet (FE) ports.

Note The MGX-XF-UI/B faceplate is the same as the MGX-XF-UI (Figure 2-56), except the board silhouette is "notched" to fit into the RCON of the MGX 8880 Media Gateway, directly behind the RPM-XF card. Figure 2-57 shows the MGX-XF-UI/B board.

Figure 2-57 MGX-XF-UI/B Card—Side View



1	Notched card, to fit into the MGX 8880 RCON		

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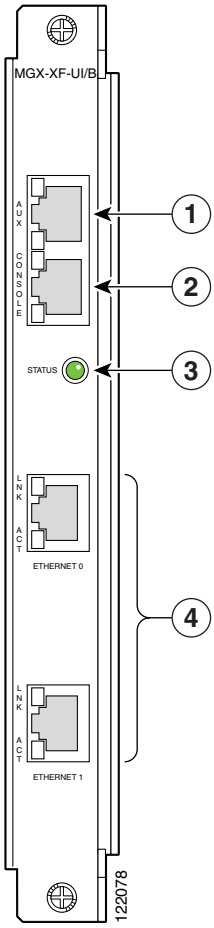
Figure 2-58 MGX-XF-UI/B Faceplate



1	AUX—An RJ-45 receptacle that provides connection to an auxiliary device that is used as an external terminal for local administrative access.	**3**	STATUS LED • Green—The back card is active. • Off—The back card is not detected or a major failure has disabled the back card.
2	CONSOLE—An RJ-45 receptacle that provides a serial connection used for an external terminal for local administrative access.	**4**	ETHERNET 0 AND ETHERNET 1—Two fast ethernet (FE) RJ-45 receptacles that comply with Ethernet standards and that are used to connect the RPM-XF to a 10/100BASE-T network management LAN.

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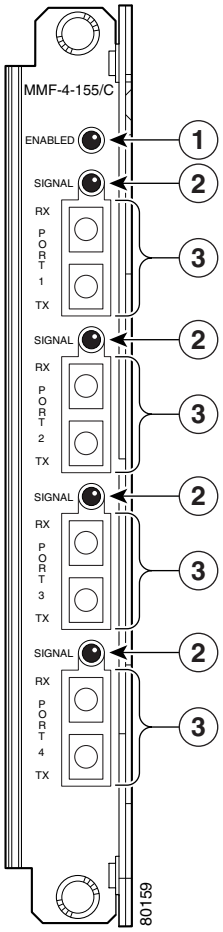
MMF-4-155/C

The MMF-4-155/C is a multimode fiber back card that provides four SONET/SDH OC-3c/STM-1 interfaces, each operating at 155 Mbps. Figure 2-59 shows the MMF-4-155/C faceplate. **Cables: CAB-SMF-SC-(several), and CAB-SMF-Y-SC.**

Figure 2-59 MMF-4-155/C Faceplate



1	ENABLED LED • Green—The back card is active. • Off—The back card is not active.	**3**	RX and TX SC connectors for PORT 1 through PORT 4
2	SIGNAL LED • Green—The back card is receiving a signal on the corresponding line.		

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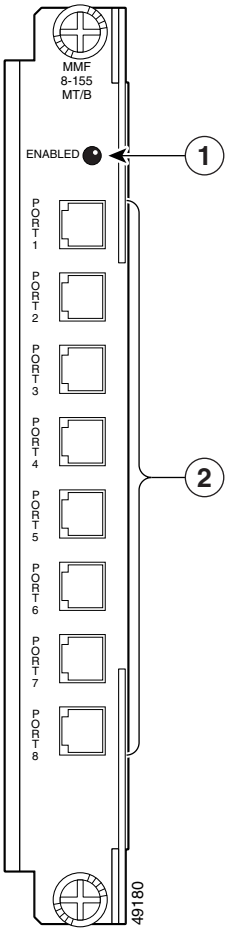
MMF-8-155-MT and MMF-8-155-MT/B

The MMF-8-155-MT and the MMF-8-155-MT/B are multimode fiber back cards that provide eight SONET/SDH OC-3c/STM-1 interfaces, each operating at 155 Mbps. Figure 2-60 shows the MMF-8-155-MT and MMF-8-155-MT/B faceplate.

Note The only visible difference between the back card faceplates is the product name, which is silk-screened on the front of each faceplate.

Figure 2-60 MMF-8-155-MT and MMF-8-155-MT/B Faceplate



1	ENABLED LED • Green—The back card is active. • Off—The back card is not active.	2	8 SONET/SDH OC-3c/STM-1 interface MTRJ connectors

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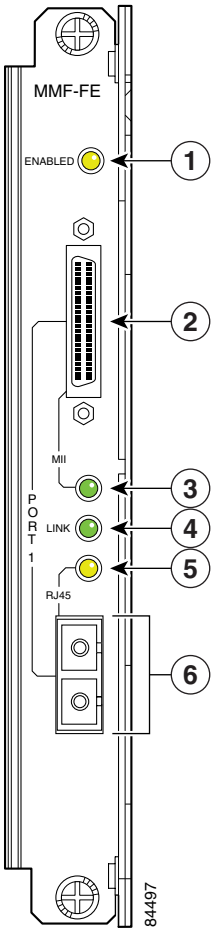
MMF-FE

The MMF-FE is a one-port back card that provides a choice of two Ethernet connectors for 100BASE-FX connection to MMF. You can use an SC type fiber optic connector or an MII connector that requires an external transceiver to complete the optical connection. Figure 2-61 shows the MMF-FE faceplate.
Cables: CAB-MMF-SC (several).

Figure 2-61 MMF-FE Faceplate



1	ENABLED LED • Green—The back card is active. • Off—The back card is not active.	**4**	LINK LED—This LED is on when the SC port is active and the back card is receiving a carrier signal from the network. When the MII port is active, this LED indicates network activity, and it flickers on and off at a rate that reflects that activity.
2	MII connector—Can be used with a variety of transceivers to connect to different media types.	**5**	RJ45 LED—When lit, this LED indicates that the SC connector has been enabled by the software.
3	MII LED—When lit, this LED indicates that the MII connector has been enabled by the software.	**6**	SC connector—Used to connect to multimode fiber media.

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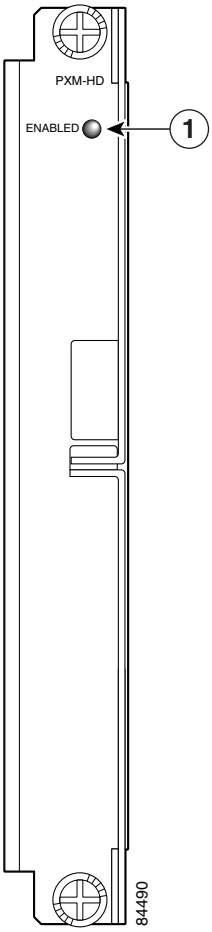
PXM-HD

The PXM-HD is a single-height back card that is installed in the MGX 8850 (PXM45) switch. It houses a 6-GB hard disk drive that contains all switch and network-related information and an OC-3c uplink controller port. Figure 2-62 shows the PXM-HD faceplate.

Note The PXM-HD has a switch that is activated by the ejector lever on the faceplate. The module must be fully seated in the switch. Tighten the two captive screws on the faceplate to ensure that the switch is activated.

Figure 2-62 PXM-HD Faceplate



1	ENABLED LED • Green—The back card is active. • Off—The back card is not active.		

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PXM-UI-S3 and PXM-UI-S3/B

The user interface back card (PXM-UI-S3 or PXM-UI-S3/B) provides management interfaces for configuring the switch, using external clocks, and triggering external alarms. The user interface back card also provides Stratum-3 network clocking and is installed in the top bay of the switch (when the switch is viewed from the rear) behind the PXM45 or PXM1E. For cable information, see Table B-14 on page B-14.

Release Compatibility Information for PXM-UI-S3 Cards

The PXM-UI-S3 card is supported in the following releases:

Table 2-44 PXM-UI-S3 Card Compatibility by Chassis and Release

PXM-UI-S3 Model	MGX 8850 (PXM45)				MGX 8830	MGX 8950	MGX 8880
	PXM45	PXM45/B	PXM45/C	MGX 8850 (PXM1E)	PXM1E	PXM45/B or PXM45/C	PXM45/
PXM-UI-S3	Release 2 and higher	Release 3 and earlier	Not supported on PXM45/C	Release 3.0.00	Y	Not supported on PXM45/C	Not applicable
PXM-UI-S3/B	Not supported on PXM45	Release 3.0.10 and higher	Release 4 and higher	Release 3.0.10 and higher	Release 3.0.10 and higher		Release 5 and higher

The PXM45/C card was introduced in Release 4. See the tables earlier in this chapter for Release details regarding other cards, for example, Table 2-3 on page 2-5.

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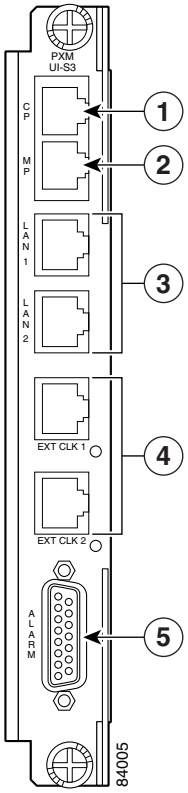
Figure 2-63 shows the PXM-UI-S3 back card faceplate.

Figure 2-63 PXM-UI-S3 Faceplate



1	An RJ-45 receptacle for the control port (CP)	**4**	Two RJ-48 external T1/E1 clock ports and LEDs (EXT CLK 1 and EXT CLK 2) • Green—The clock is active. • Off—The clock is either inactive or not provided.
2	An RJ-45 receptacle for the maintenance port (MP)	**5**	One DB-15 female connector ALARM port for visual and audible alarms (critical, major, and minor)
3	Two RJ-45 receptacles for the LAN ports (LAN1 and LAN2) **Note** LAN2 is not supported.		

Note The control port has a default data rate of 9600 bps. The data rate is configurable using the cnfserialif command from 1200 bps to 38400 bps.

The LAN1 port provides a 10/100 base-T Ethernet interface.

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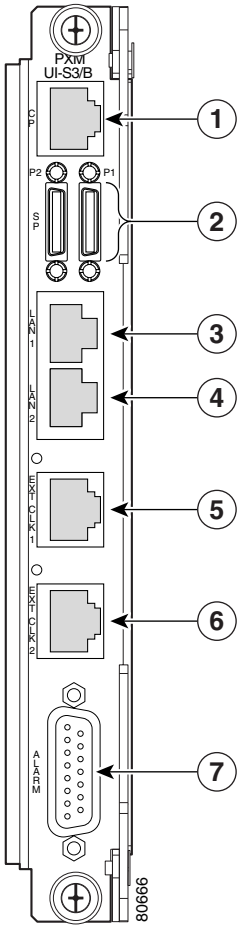
Figure 2-64 shows the PXM-UI-S3/B back card faceplate. See Table 2-22 for PXM1E and PXM-UI-S3/B compatibility. For cable information, see Table B-14 on page B-14.

Figure 2-64 PXM-UI-S3/B Faceplate



1	An RJ-45 receptacle for the control port (CP) PNNI modem port. **Note** Unlike the PXM-UI-S3 card, the PXM-UI-S3/B card doe not have an MP port.	**4**	Two RJ-48 external T1/E1 clock ports and LEDs (EXT CLK 1 and EXT CLK 2) • Green—The clock is active. • Off—The clock is either inactive or not provided.
2	Miniature D connectors to support two additional serial ports (SP) for PORT 1 and PORT 2 IOS control port	**5**	One DB-15 female connector ALARM port for visual and audible alarms (critical, major, and minor)
3	Two RJ-45 receptacles for the LAN ports (LAN1 and LAN2) IOS modem port **Note** LAN2 is reserved for future use.		

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Note The control port has a default data rate of 9600 bps. The data rate is configurable using the cnfserialif command from 1200 bps to 38400 bps.

The LAN1 port provides a 10/100 base-T Ethernet interface.

RBBN-16-T1E1

The RBBN-16-T1E1 is a back card that provides 16 T1/E1 interfaces through two RBBN connectors. Figure 2-65 shows the RBBN-16-T1E1 faceplate. **Cables: CAB-RBBN-16-T1E1 and CAB-RBBN-16T1E1-Y.**

Note Figure 2-65 does not show its bail latches. See Figure B-11 on page B-38 and Figure B-12 on page B-39 for cable drawings.

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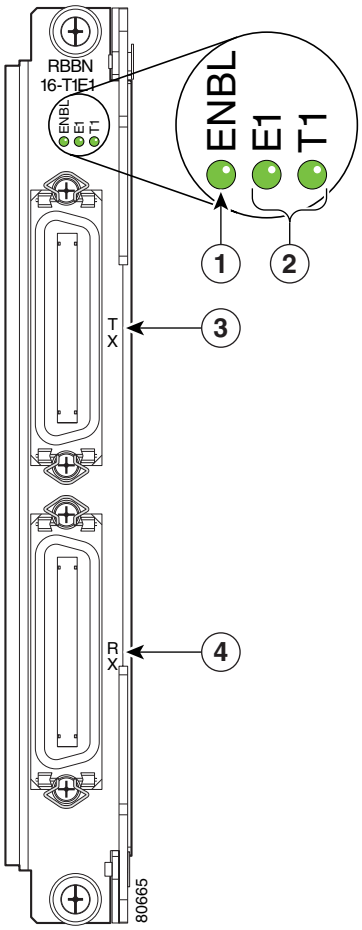
Figure 2-65 RBBN-16-T1E1 Faceplate



1	Enabled LED (ENBL) • Green—The back card is active. • Off—The back card is not active.	**3**	36-pin female RBBN connector—TX
2	E1 and T1 LEDs • Green—The back card is operating in E1 or T1 mode.	**4**	36-pin female RBBN connector—RX

RBBN-16-T1E1-1N

The RBBN-16-T1E1-1N is a back card that provides 16 T1/E1 interfaces through two RBBN connectors. Figure 2-66 shows the RBBN-16-T1E1-1N faceplate.

Supports 1:N redundancy in the following switches:

- MGX 8830/B (with RCON-1TO3-8830)
- MGX 8850/B (with RCON-1TO3-8850 or RCON-1TO5-8850)

Redundant back card is RED-16-T1E1.

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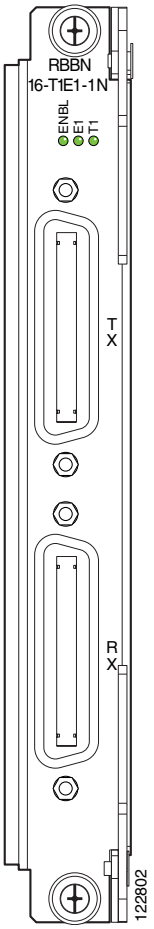
Note Figure 2-66 does not show its bail latches.

Figure 2-66 RBBN-16-T1E1-1N Faceplate



1	Enabled LED (ENBL) • Green—The back card is active. • Off—The back card is not active.	**3**	36-pin female RBBN connector—TX
2	E1 and T1 LEDs • Green—The back card is operating in E1 or T1 mode.	**4**	36-pin female RBBN connector—RX

RED-16-T1E1

The RED-16-T1E1 is a redundant back card for the MPSM-16-T1E1 front card. Figure 2-67 shows the RED-16-T1E1 faceplate.

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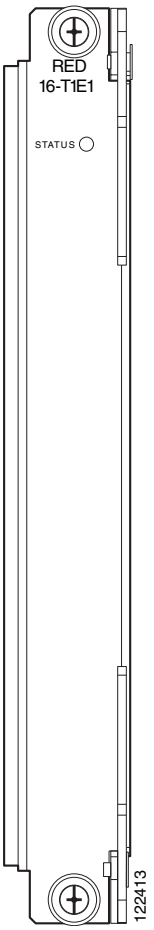
Figure 2-67 RED-16-T1E1



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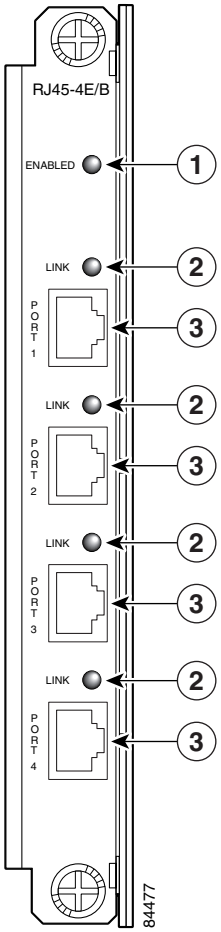
RJ45-4E/B

The RJ45-4E/B is a back card that provides four IEEE 802.3 Ethernet 10BASE-T interfaces. Figure 2-68 shows the RJ45-4E/B faceplate.

Figure 2-68 RJ45-4E/B Faceplate



1	ENABLED LED • Green—The back card is active. • Off—The back card is not active.	**3**	PORT 1 through PORT 4 RJ-45 connectors
2	LINK LEDs • Green—The back card is receiving a carrier signal from the network.		

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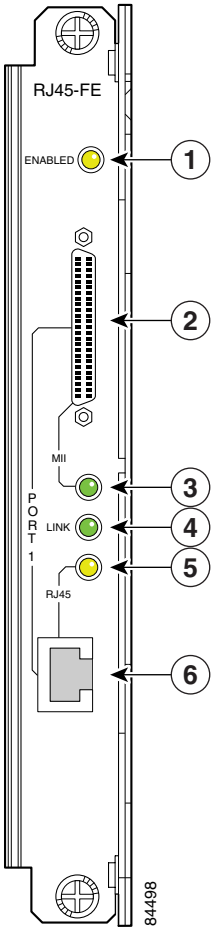
RJ45-FE

The RJ45-FE back card has an RJ-45 connector to attach to Category 5 UTP for 100BASE-TX, and a media independent interface (MII) connector that permits connection through external transceivers to multimode fiber for 100BASE-FX physical media. Figure 2-69 shows the RJ45-FE faceplate.

Figure 2-69 RJ45-FE Faceplate



1	ENABLED LED • Green—The back card is active. • Off—The back card is not active.	**4**	LINK LED—This LED is on when the RJ-45 port is active and the back card is receiving a carrier signal from the network. When the MII port is active, this LED indicates network activity, and it flickers on and off at a rate that reflects that activity.
2	MII connector—Can be used with a variety of transceivers to connect to different media types.	**5**	RJ45 LED—When lit, this LED indicates that the RJ-45 connector has been enabled by the software.
3	MII LED—When lit, this LED indicates that the MII connector has been enabled by the software.	**6**	RJ45 connector—Used for connection to 100BASE-T media.

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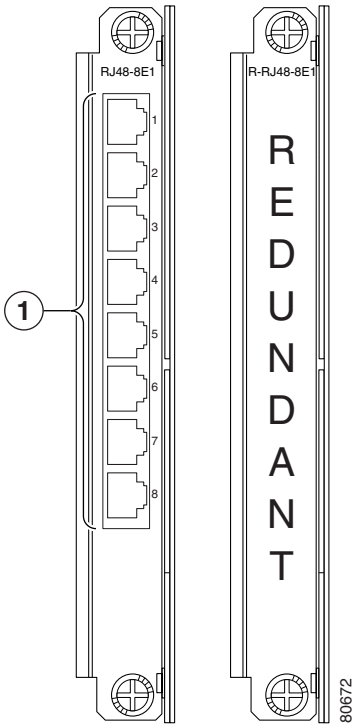
RJ48-8E1 and R-RJ48-8E1

The RJ48-8E1 and R-RJ48-8E1 are single-height back cards that provide eight RJ-48 connectors for E1 lines. Figure 2-70 shows the RJ48-8E1 and R-RJ48-8E1 faceplates. The R-RJ48-8E1 has no connectors on the front of the faceplate.

Figure 2-70 RJ48-8E1 and R-RJ48-8E1 Faceplates



1	Eight RJ-48 connectors for E1 lines		

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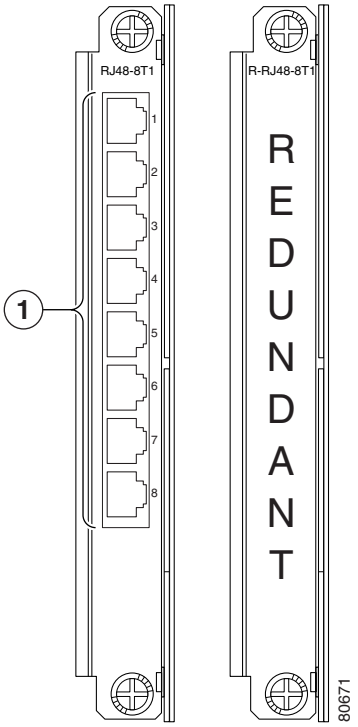
RJ48-8T1 and R-RJ48-8T1

The RJ48-8T1 and R-RJ48-8T1 are single-height back cards that provide eight RJ-48 connectors for T1 lines. Figure 2-71 shows the RJ48-8T1 and R-RJ48-8T1 faceplates. The R-RJ48-8T1 has no connectors on the front of the faceplate.

Figure 2-71 RJ48-8T1 and R-RJ48-8T1 Faceplates



1	Eight RJ-48 connectors for T1 lines		

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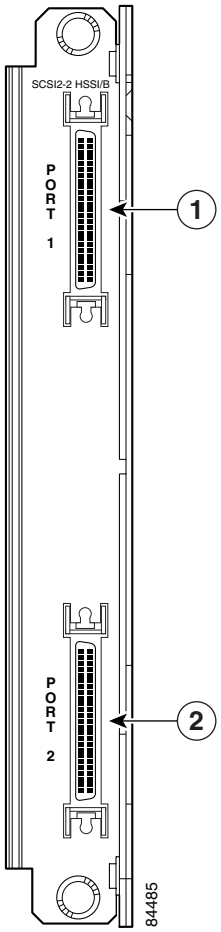
SCSI2-2HSSI/B

The SCSI2-2HSSI/B is a back card that provides two unchannelized HSSI interfaces. Each interface supports approximately 51 Mbps. With both lines operating, each card supports a maximum throughput of 70 Mbps. Figure 2-72 shows the SCSI2-2HSSI faceplate. **Cables: CAB-SCSI2-Y and CAB-SCSI2-Y=.**

Figure 2-72 MGX-SCSI2-2HSSI Faceplate



1	SCSI female connector for PORT 1	**2**	SCSI female connector for PORT 2

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SFP-2-155

The SFP-2-155 is a back card that provides two OC-3c/STM-1 interfaces operating at 155 Mbps. Both OC-3c ports have SONET transceivers that allow you to interchange or combine transceivers. Table 2-45 provides details for the transceivers that are supported on the SFP-2-155 card.

Table 2-45 SFP-2-155 Transceiver Information

Transceiver	Physical Connection	Wavelength	Distance
MMF-1-155-SFP	MMF cable with LC connectors	1310 nm	2 km
SMFIR-1-155-SFP	SMFIR cable with LC connectors	1310 nm	15 km
SMFLR-1-155-SFP	SMFLR cable with LC connectors	1310 nm	40 km

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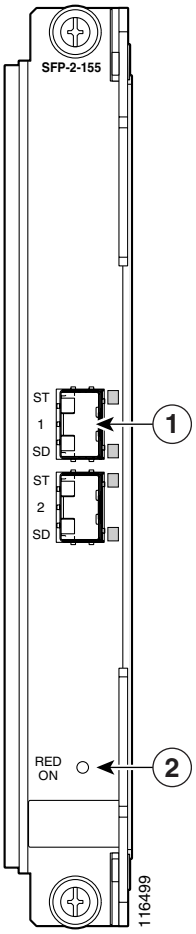
Figure 2-73 shows the SFP-2-155 faceplate. **Cables: CAB-MMF-LC, CAB-MMF-LC-Y, CAB-SMFIR-LC, CAB-SMFLR-LC-Y, CAB-SMFIR-LC-Y, CAB-SMFLR-LC, CAB-SMF-LC, CAB-SMF-LC-YSMB-.**

Figure 2-73 SFP-2-155 Faceplate



1	TopStatus LED (ST) has two software-controlled states: • Green—Card is Active • Yellow—Card is in Standby Bottom Signal Detect LED (SD) has two states, which can be controlled by hardware: • Green—Port with signal detected in the Receive direction • Flashing green—Port with no signal detected in the Receive direction	**2**	RED ON LED

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SFP-8-155

The SFP-8-155 is a back card that provides eight OC-3c/STM-1 interfaces operating at 155 Mbps. All eight OC-3c ports have SONET transceivers that allow you to interchange or combine transceivers. Table 2-46 provides details for the transceivers that are supported on the SFP-8-155 card.

Table 2-46 SFP-8-155 Transceiver Information

Transceiver	Physical Connection	Wavelength	Distance
MMF-1-155-SFP	MMF cable with LC connectors	1310 nm	2 km
SMFIR-1-155-SFP	SMFIR cable with LC connectors	1310 nm	15 km
SMFLR-1-155-SFP	SMFLR cable with LC connectors	1310 nm	40 km

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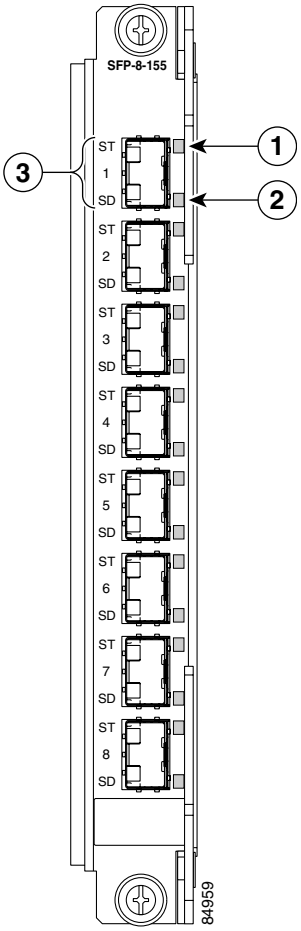
Figure 2-74 shows the SFP-8-155 faceplate. **Cables: CAB-MMF-LC, CAB-MMF-LC-Y, CAB-SMFIR-LC, CAB-SMFIR-LC-Y, CAB-SMFLR, CAB-SMFLR-Y.**

Figure 2-74 SFP-8-155 Faceplate



1	Top LED (ST) has two software-controlled states: • Green—Card is Active • Yellow—Card is in Standby	**3**	There are two LEDs per port: The top LED is ST (Status); the bottom is SD (Signal Detect)
2	Bottom LED is SD (Signal Detect)		

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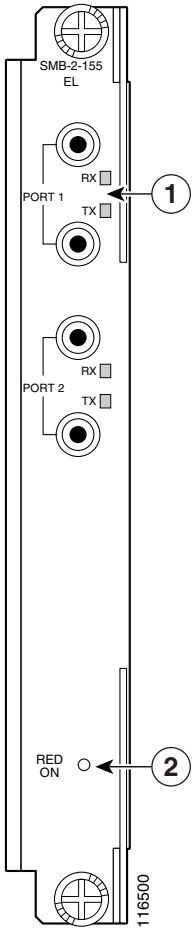
SMB-2-155-EL

The SMB-2-155-EL is an electrical back card that provides two OC-3c/STM-1 interfaces, each operating at 155 Mbps. Figure 2-75 shows the SMB-2-155-EL faceplate. **Cables: CAB-SMB-BNC-Y, CAB-T3/E3-PL-AD.**

Figure 2-75 SMB-2-155-EL Faceplate



1	PORT LEDs for Rx and Tx	**2**	RED ON

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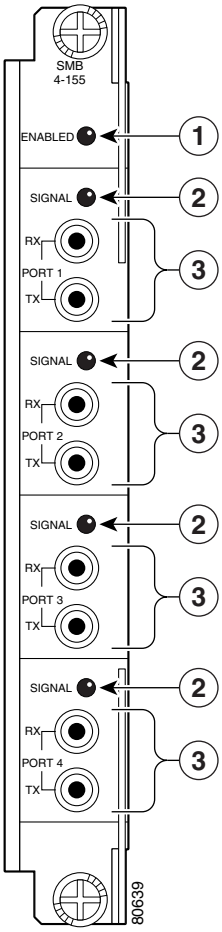
SMB-4-155

The SMB-4-155 is a back card that provides four OC-3c/STM-1 interfaces, each operating at 155 Mbps. Figure 2-76 shows the SMB-4-155 faceplate. **Cables: CAB-T3E3-PL-AD, CAB-SMB-BNC-Y, CAB-T3E3-PL-CE-AD, and CAB-T3E3-PL-CE-Y**.

Figure 2-76 SMB-4-155 Faceplate



1	ENABLED LED • Green—The back card is active. • Off—The back card is not active.	**3**	RX and TX SMB female connectors for PORT 1 through PORT 4
2	SIGNAL LED • Green—The back card is receiving a signal on the corresponding line.		

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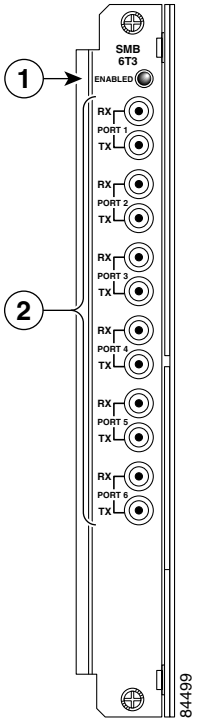
SMB-6-T3E3

The SMB-6-T3E3 is a single-height back card that provides six T3 or E3 interfaces. Figure 2-77 shows the SMB-6-T3E3 faceplate. **Cables: CAB-T3E3-PL-AD, CAB-SMB-BNC-Y.**

Figure 2-77 SMB-6-T3E3 Faceplate



1	ENABLED LED • Green—The back card is active. • Off—The back card is not active.	2	RX and TX SMB female connectors for PORT 1 through PORT 6

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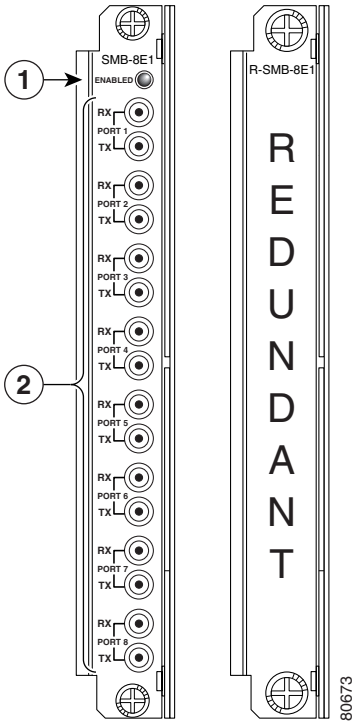
SMB-8E1 and R-SMB-8E1

The SMB-8E1 and R-SMB-8E1 are single-height back cards that provide eight SMB connectors for E1 lines. Figure 2-78 shows the SMB-8E1 and R-SMB-8E1 faceplates. The R-SMB-8E1 has no connectors on the front of the faceplate. **Cables: CAB-T3E3-PL-AD, CAB-T3E3-PL-CE-AD, CAB-T3E3-PL-CE-Y, and CAB-SMB-BNC-Y.**

Figure 2-78 SMB-8E1 and R-SMB-8E1 Faceplates



1	ENABLED LED • Green—The back card is active. • Off—The back card is not active.	2	RX and TX SMB female connectors for PORT 1 through PORT 8

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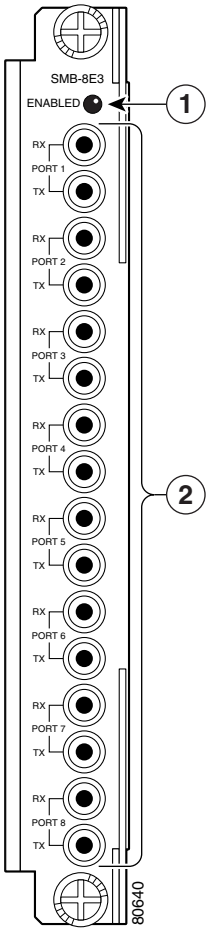
SMB-8E3

The SMB-8E3 is a back card that provides eight E3 interfaces. Figure 2-79 shows the SMB-8E3 faceplate. **Cables: CAB-T3E3-PL-AD, CAB-T3E3-PL-CE-AD, CAB-T3E3-PL-CE-Y, and CAB-SMB-BNC-Y.**

Figure 2-79 SMB-8E3 Faceplate



1	ENABLED LED • Green—The back card is active. • Off—The back card is not active.	**2**	RX and TX SMB female connectors for PORT 1 through PORT 8

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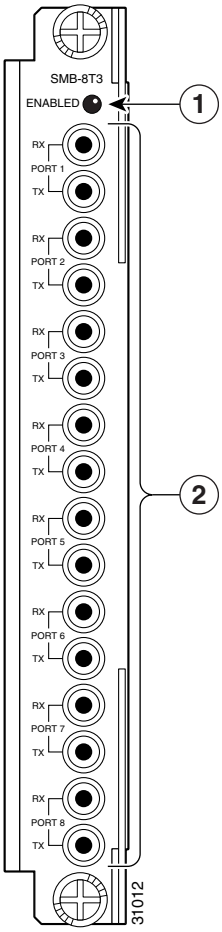
SMB-8T3

The SMB-8T3 is a back card that provides eight T3 interfaces. Figure 2-80 shows the SMB-8T3 faceplate. **Cables: CAB-T3E3-PL-AD, CAB-T3E3-PL-CE-AD, CAB-T3E3-PL-CE-Y, and CAB-SMB-BNC-Y.**

Figure 2-80 SMB-8T3 Faceplate



1	ENABLED LED • Green—The back card is active. • Off—The back card is not active.	**2**	RX and TX SMB female connectors for PORT 1 through PORT 8

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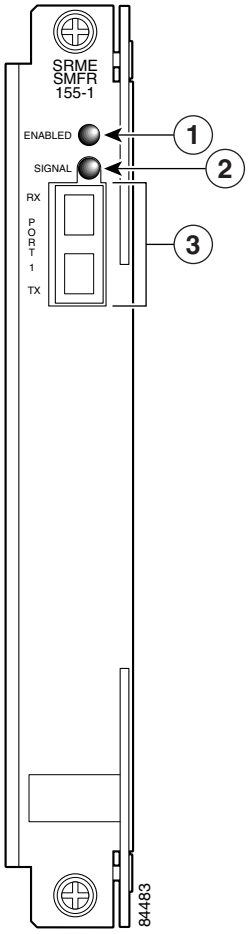
SMFIR-1-155

The SMFIR-1-155 is a single-mode fiber, intermediate-reach back card that provides one OC-3c/STM-1 interface operating at 155 Mbps. Figure 2-81 shows the SMFIR-1-155 faceplate. **Cable: CAB-SMF-SC- (several).**

Figure 2-81 SMFIR-1-155 Faceplate



1	ENABLED LED • Green—The back card is active. • Off—The back card is not active.	**3**	RX and TX SC connectors for PORT 1
2	SIGNAL LED • Green—The back card is receiving a signal on the corresponding line.		

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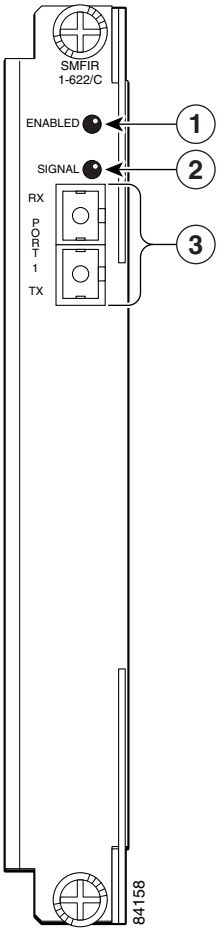
SMFIR-1-622/C

The SMFIR-1-622/C is a single-mode fiber, intermediate-reach back card that provides one OC-12c/STM-4 interface operating at 622 Mbps. Figure 2-82 shows the SMFIR-1-622/C faceplate. **Cable: CAB-SMF-SC- (several), CAB-SMF-Y-SC.**

Figure 2-82 SMFIR-1-622/C Faceplate



1	ENABLED LED • Green—The back card is active. • Off—The back card is not active.	**3**	RX and TX SC connector for PORT 1
2	SIGNAL LED • Green—The back card is receiving a signal on the corresponding line.		

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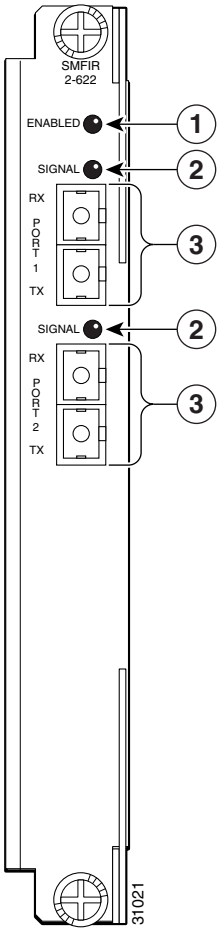
SMFIR-2-622 and SMFIR-2-622/B

The SMFIR-2-622 and the SMFIR-2-622/B are single-mode fiber, intermediate-reach back cards that provide two OC-12c/STM-4 interfaces, each operating at 622 Mbps. Figure 2-83 shows the SMFIR-2-622 and SMFIR-2-622/B faceplate. **Cable: CAB-SMF-SC- (several), CAB-SMF-Y-SC.**

Note The only visible difference between the back card faceplates is the product name, which is silk-screened on the front of each faceplate.

Figure 2-83 SMFIR-2-622 and SMFIR-2-622/B Faceplate



1	ENABLED LED • Green—The back card is active. • Off—The back card is not active.	**3**	RX and TX SC connectors for PORT 1 and PORT 2
2	SIGNAL LEDs • Green—The back card is receiving a signal on the corresponding line.		

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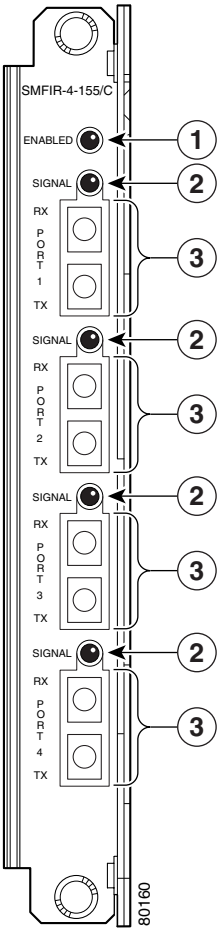
SMFIR-4-155/C

The SMFIR-4-155/C is a single-mode fiber, intermediate-reach back card that provides four OC-3c/STM-1 interfaces, each operating at 155 Mbps. Figure 2-84 shows the SMFIR-4-155/C faceplate. **Cable: CAB-SMF-SC- (several), CAB-SMF-Y-SC.**

Figure 2-84 SMFIR-4-155/C Faceplate



1	ENABLED LED • Green—The back card is active. • Off—The back card is not active.	**3**	RX and TX SC connectors for PORT 1 through PORT 4
2	SIGNAL LED • Green—The back card is receiving a signal on the corresponding line.		

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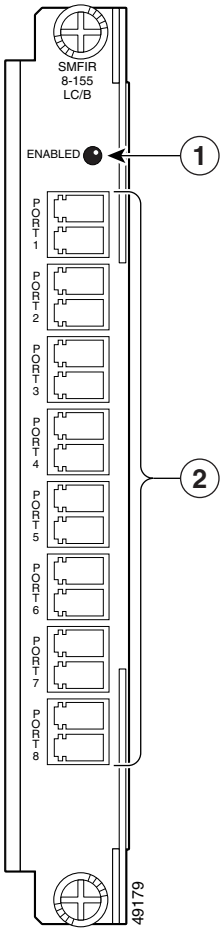
SMFIR-8-155-LC and SMFIR-8-155-LC/B

The SMFIR-8-155-LC and the SMFIR-8-155-LC/B are single-mode fiber, intermediate-reach back cards that provide eight SONET/SDH OC-3c/STM-1 interfaces, each operating at 155 Mbps. Figure 2-85 shows the SMFIR-8-155-LC and SMFIR-8-155-LC/B faceplate. **Cables: CAB-SMF-LC and CAB-SMF-LC-Y.**

Note The only visible difference between the back card faceplates is the product name, which is silk-screened on the front of each faceplate.

Figure 2-85 SMFIR-8-155-LC and SMFIR-8-155-LC/B Faceplate



1	ENABLED LED • Green—The back card is active. • Off—The back card is not active.	**2**	RX and TX LC connectors for PORT 1 through PORT 8 **Note** For each port, the top LC connector is for RX and the bottom LC connector is for TX.

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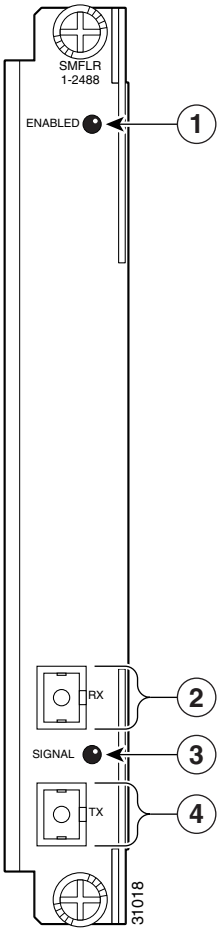
SMFLR-1-2488 and SMFLR-1-2488/B

The SMFLR-1-2488 and SMFLR-1-2488/B are single-mode fiber, long-reach back cards that provide one OC-48c/STM-16 interface, operating at 2488 Mbps. Figure 2-86 shows the SMFLR-1-2488 and SMFLR-1-2488/B faceplate. **Cable: CAB-SMF-SC- (several), CAB-SMF-Y-SC.**

Note The only visible difference between the back card faceplates is the product name, which is silk-screened on the front of each faceplate.

Figure 2-86 SMFLR-1-2488 and SMFLR-1-2488/B Faceplate



1	ENABLED LED • Green—The back card is active. • Off—The back card is not active.	**3**	SIGNAL LED • Green—The back card is receiving a signal on the corresponding line.
2	RX SC connector	**4**	TX SC connector

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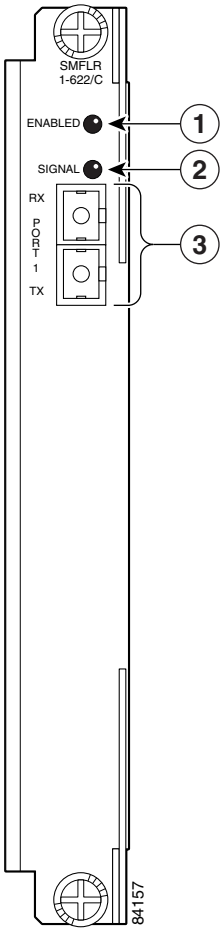
SMFLR-1-622/C

The SMFLR-1-622/C is a single-mode fiber, long-reach back card that provides one OC-12c/STM-4 interface operating at 622 Mbps. Figure 2-87 shows the SMFLR-1-622/C faceplate. **Cable: CAB-SMF-SC- (several), CAB-SMF-Y-SC.**

Figure 2-87 SMFLR-1-622/C Faceplate



1	ENABLED LED • Green—The back card is active. • Off—The back card is not active.	**3**	RX and TX SC connector for PORT 1
2	SIGNAL LED • Green—The back card is receiving a signal on the corresponding line.		

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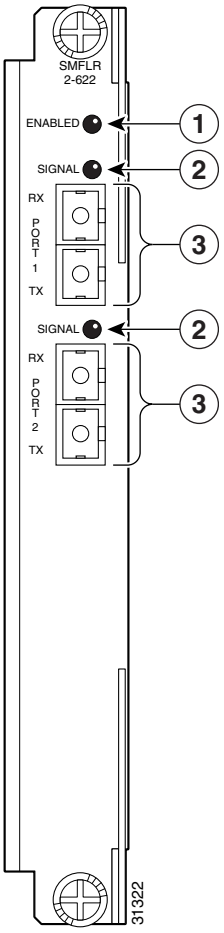
SMFLR-2-622 and SMFLR-2-622/B

The SMFLR-2-622 and the SMFLR-2-622/B are single-mode fiber, long-reach back cards that provide two OC-12c/STM-4 interfaces, each operating at 622 Mbps. Figure 2-88 shows the SMFLR-2-622 and the SMFLR-2-622/B faceplate. **Cable: CAB-SMF-SC- (several), CAB-SMF-Y-SC.**

Note The only visible difference between the back card faceplates is the product name, which is silk-screened on the front of each faceplate.

Figure 2-88 SMFLR-2-622 and SMFLR-2-622/B Faceplate



1	ENABLED LED • Green—The back card is active. • Off—The back card is not active.	**3**	RX and TX SC connectors for PORT 1 and PORT 2
2	SIGNAL LEDs • Green—The back card is receiving a signal on the corresponding line.		

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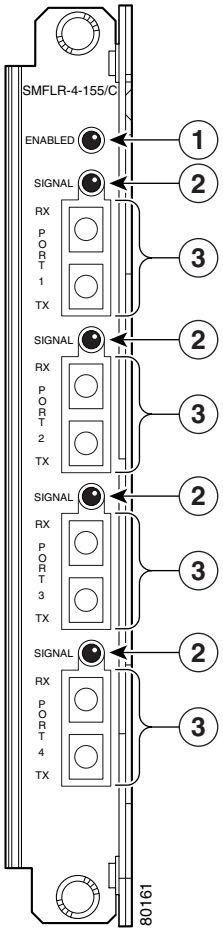
SMFLR-4-155/C

The SMFLR-4-155/C is a single-mode fiber, long-reach back card that provides four SONET OC-3c/STM-1 interfaces, each operating at 155 Mbps. Figure 2-89 shows the SMFLR-4-155/C faceplate. **Cable: CAB-SMF-SC- (several), CAB-SMF-Y-SC.**

Figure 2-89 SMFLR-4-155/C Faceplate



1	ENABLED LED • Green—The back card is active. • Off—The back card is not active.	**3**	RX and TX SC connectors for PORT 1 through PORT 4
2	SIGNAL LED • Green—The back card is receiving a signal on the corresponding line.		

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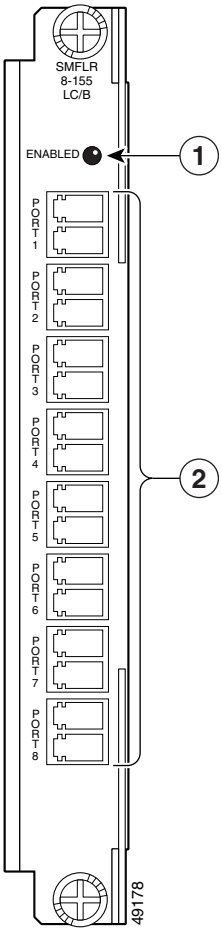
SMFLR-8-155-LC and SMFLR-8-155-LC/B

The SMFLR-8-155-LC and the SMFLR-8-155-LC/B are single-mode fiber, long-reach back cards that provide eight SONET/SDH OC-3c/STM-1 interfaces, each operating at 155 Mbps. Figure 2-90 shows the SMFLR-8-155-LC and SMFLR-8-155-LC/B faceplate. **Cables: CAB-SMF-LC and CAB-SMF-LC-Y.**

Note The only visible difference between the back card faceplates is the product name, which is silk-screened on the front of each faceplate.

Figure 2-90 SMFLR-8-155-LC and SMFLR-8-155-LC/B Faceplate



1	ENABLED LED • Green—The back card is active. • Off—The back card is not active.	**2**	TX and RX LC connectors for PORTs 1 through 8 **Note** For each port, the top LC connector is for RX and the bottom LC connector is for TX.

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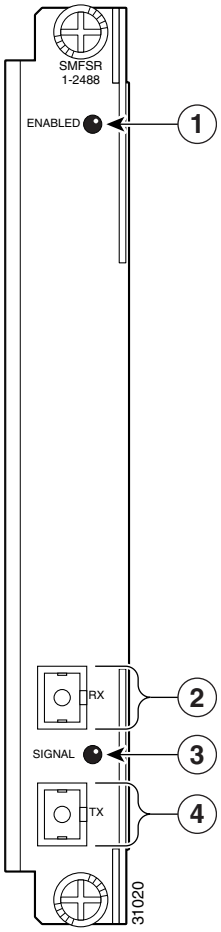
SMFSR-1-2488 and SMFSR-1-2488/B

The SMFSR-1-2488 and the SMFSR-1-2488/B are single-mode fiber, short-reach back cards that provide one OC-48c/STM-16 interface operating at 2488 Mbps. Figure 2-91 shows the SMFSR-1-2488 and SMFSR-1-2488/B faceplate. **Cables: CAB-SMF-SC-(several), CAB-SMF-Y-SC.**

Note The only visible difference between the back card faceplates is the product name, which is silk-screened on the front of each faceplate.

Figure 2-91 SMFSR-1-2488 and SMFSR-1-2488/B Faceplate



1	ENABLED LED • Green—The back card is active. • Off—The back card is not active.	**3**	SIGNAL LED • Green—The back card is receiving a signal on the corresponding line.
2	RX SC connector	**4**	TX SC connector

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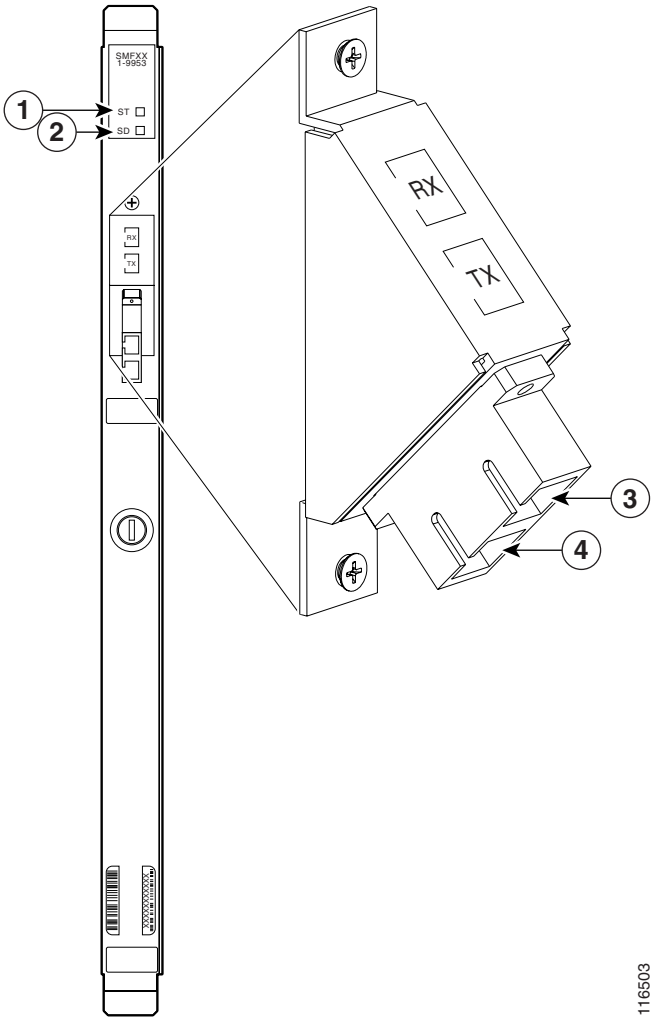
SMFSR-1-9953

With the SMFSR-1-9953, SMFIR-1-9953, SMFLR-1-9953 back card assembly, the AXSM-1-9953-XG can work at the OC-192 rate, providing one OC-192 port/trunk. Figure 2-92 shows the SMFSR-1-9953 faceplate. **Cables: CAB-SMF-SC, CAB-SMF-Y-SC.**

Warning **This connector shields a Class 1 laser. Do not look into the connector.**

Figure 2-92 SMFSR-1-9953 Faceplate



1	Status (ST) LED • Green—The back card is active. • Off—The back card is not active.	**3**	Rx
2	Signal Detect (SD) LED	**4**	Tx

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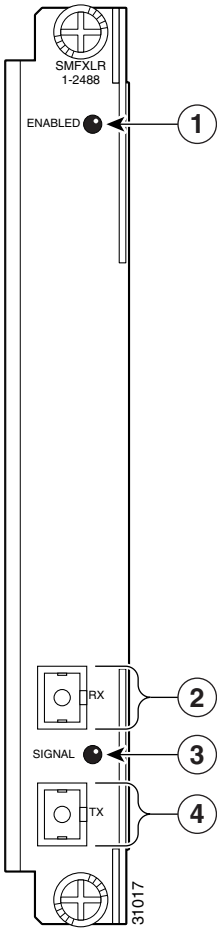
SMFXLR-1-2488 and SMFXLR-1-2488/B

The SMFXLR-1-2488 and the SMFXLR-1-2488/B are single-mode fiber, extended long-reach back cards that provide one OC-48c/STM-16 interface operating at 2488 Mbps. Figure 2-93 shows the SMFXLR-1-2488 and SMFXLR-1-2488/B faceplate. **Cables: CAB-SMF-SC- (several), CAB-SMF-Y-SC.**

Note The only visible difference between the back card faceplates is the product name, which is silk-screened on the front of each faceplate.

Figure 2-93 SMFXLR-1-2488 and SMFXLR-1-2488/B Faceplate



1	ENABLED LED • Green—The back card is active. • Off—The back card is not active.	**3**	SIGNAL LED • Green—The back card is receiving a signal on the corresponding line.
2	RX SC connector	**4**	TX SC connector

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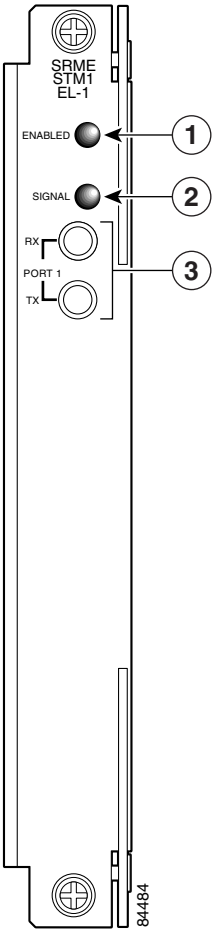
STM1-EL-1

The STM1-EL-1 is a back card that provides one STM1 interface. Figure 2-94 shows the STM1-EL-1 faceplate. **Cables: CAB-T3E3-PL-AD and CAB-SMB-BNC-Y (United States). CAB-T3E3-PL-CE and CAB-T3E3-PL-CE-Y (International).**

Figure 2-94 STM1-EL-1 Faceplate



1	ENABLED LED • Green—The back card is active. • Off—The back card is not active.	**3**	RX and TX SMB female connectors
2	SIGNAL LED • Green—The back card is receiving a signal on the corresponding line.		

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T3E3-155

The T3E3-155 is a back card that provides eight T3/E3 interfaces and four OC-3c interfaces. All eight electrical ports can be configured to be either all T3 lines or all E3 lines, but they cannot be mixed. All four OC-3c ports have SONET transceivers that allow you to interchange or combine transceivers. Table 2-47 provides details for the transceivers that are supported on the T3E3-155.

Table 2-47 T3E3-155 Transceiver Information

Transceiver	Physical Connection	Wavelength	Distance
MMF-1-155-SFP	MMF cable with LC connectors	1310 nm	2 km
SMFIR-1-155-SFP	SMFIR cable with LC connectors	1310 nm	15 km
SMFLR-1-155-SFP	SMFLR cable with LC connectors	1310 nm	40 km

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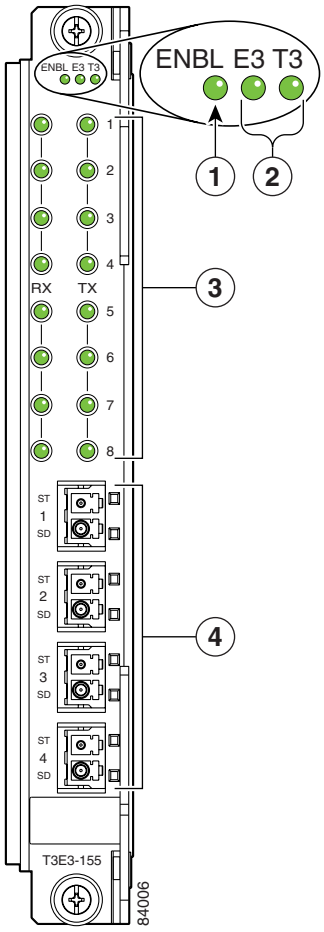
Figure 2-95 shows the T3E3-155 faceplate. **Cables for item 3:CAB-MCC-T1E1 and CAB-MCC-T1E1-Y. Cables for item 4: CAB-SMF-LC, CAB-SMF-LC-Y, CAB-MMF-LC, and CAB-MMF-LC-Y.**

Figure 2-95 T3E3-155 Faceplate



1	Enabled LED (ENBL) • Green—The back card is active. • Off—The back card is not active.	**3**	RX and TX MCC female connectors for PORT 1 through PORT 8
2	E3 and T3 LEDs • Green—The back card is operating in E3 or T3 mode.	**4**	RX and TX LC connectors for PORT 1 through PORT 4

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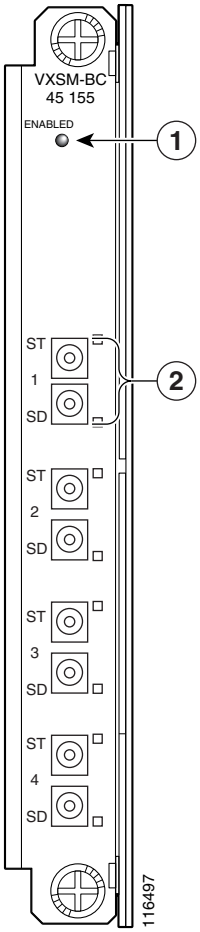
VXSM-BC-4-155

The VXSM-BC-4-155 card is a back card for the VXSM-4-155 front card. Figure 2-96 shows the VXSM-BC-4-155 faceplate.

Figure 2-96 VXSM-BC-4-155 Faceplate



1	Enabled LED (ENBL) • Green—The back card is active. • Off—The back card is not active.	**2**	There are two LEDs per port: The top LED is ST (Status); the bottom is SD (Signal Detect)

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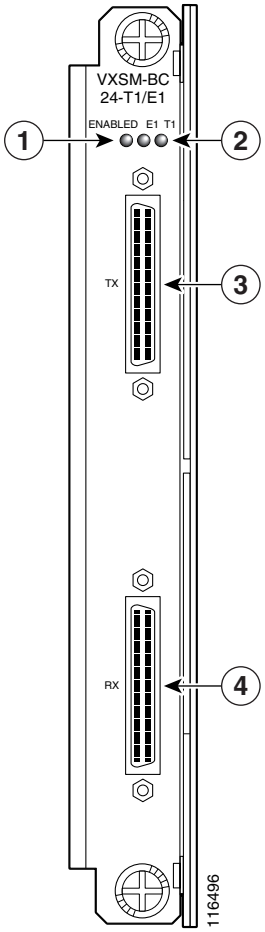
VXSM-BC-24-T1E1

The VXSM-BC-24-T1E1 card is a back card for the VXSM-T1E1 front card. Figure 2-97 shows the VXSM-BC-24-T1E1 faceplate.

Figure 2-97 VXSM-BC-24-T1E1 Faceplate



1	Enabled LED (ENBL) • Green—The back card is active. • Off—The back card is not active.	**3**	Tx Connector
2	E1 LED and T1 LED	**4**	Rx Connector

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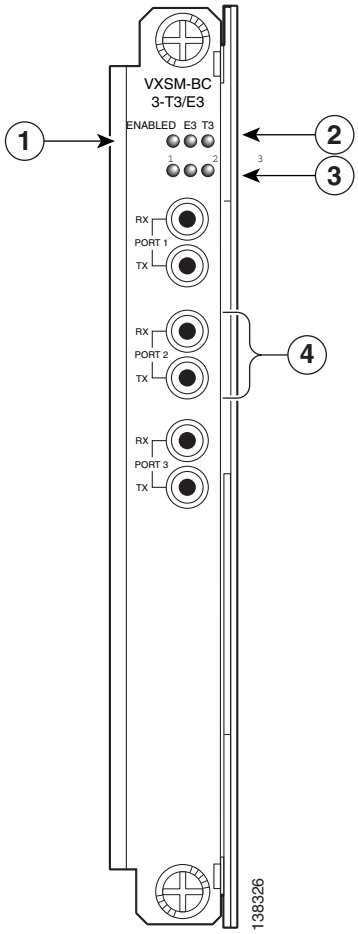
VXSM-BC-3T3

The VXSM-BC-3T3 card is a back card for the VXSM-6 T3 front card. Figure 2-98 shows the VXSM-BC-3T3 faceplate.

Figure 2-98 VXSM-BC-3T3 Faceplate



1	Enabled LED (ENBL) • Green—The back card is active. • Off—The back card is not active (standby).	**3**	Line Status LEDs (3) • Green—Line is receiving valid signal • Blinking—Loss of signal
2	T3 LED—Green if active	**4**	Tx/Rx pair of coax connectors (3)

VXSM-R-BC

The VXSM-R-BC is a redundant back card. Figure 2-99 shows the VXSM-R-BC faceplate.

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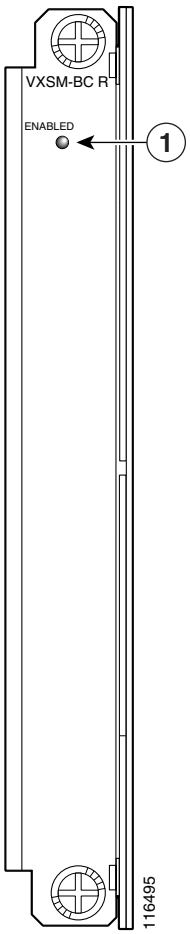
Figure 2-99 VXSM-R-BC Faceplate



1	Enabled LED (ENBL) • Green—The back card is active. • Off—The back card is not active.		

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CHAPTER 3

Preparing for Installation

This chapter lists the requirements for installing the Cisco MGX 8850, Cisco MGX 8850/B, Cisco MGX 8950, Cisco MGX 8830 and Cisco MGX 8830/B switches and their related components. It also lists requirements for installing the Cisco MGX 8880 Media Gateway. The chapter includes the following sections:

- Safety Requirements, page 3-2
- Site Requirements for the MGX 8850 or MGX 8850/B Switch, page 3-10
- Site Requirements for the MGX 8950 Switch, page 3-28
- Site Requirements for a MGX 8830 or MGX 8830/B Switch, page 3-41
- Site Requirements for the MGX 8880 Media Gateway, page 3-55
- Unpacking the Box, page 3-69
- Verifying Contents, page 3-70
- Inspecting for Damage, page 3-70

Note The information in this guide does not apply to the MGX 8850 (PXM1) switch.

Warning **Only trained and qualified personnel should install or replace this equipment.**

Warning **This unit is intended for installation in restricted access areas. A restricted access area is where access can only be gained by service personnel through the use of a special tool, lock and key, or other means of security, and is controlled by the authority responsible for the location.**

Warning **Before you start the installation procedures, read the entire chapter for important information and safety warnings.**

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Safety Requirements

This section describes safety requirements for the MGX 8850 and MGX 8850/B switch. Before you install a Cisco MGX switch, ensure that all of the criteria in this section are met.

The following sections are included:

- Safety and Equipment Precautions, page 3-2
- Working Safely with Electricity, page 3-5
- Preventing ESD Damage, page 3-7
- General Card Installation Guidelines, page 3-8

Safety and Equipment Precautions

Before you work on the equipment, be aware of standard safety guidelines and the hazards involved in working with electrical circuitry. Observe the following guidelines, cautions, and warnings and those throughout the guide for safe and hazard-free installation:

- Keep the equipment area clear and dust-free during and after installation.
- Keep tools away from walk areas where you and others could fall over them.
- Do not wear loose clothing that could get caught in the chassis. Fasten ties or scarves and roll up shirt sleeves.
- Do not wear jewelry such as rings, bracelets, or chains that could become caught in the chassis.
- Wear safety glasses if you are working under conditions that might be hazardous to your eyes.
- Do not perform any action that makes the equipment unsafe or creates a potential hazard to yourself or others.
- Because of high current leakage, you must install an earth ground connection before connecting the power supply.

Note To see translations of the warnings that appear in this guide, refer to the *Regulatory Compliance and Safety Information for Cisco Multiservice Switch Products (MGX, BPX, and SES)* document. It shipped with your chassis.

Caution Proper ESD protection is required whenever you handle Cisco equipment. Installation and maintenance personnel should be properly grounded through the use of grounding straps to eliminate the risk of ESD damage to the equipment. Modules are subject to ESD damage whenever they are removed from the chassis.

Caution To minimize ESD effects on this equipment and for compliance to GR-1089, optical cables with non-metallic connector ferrules shall be used.

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Warning **Never attempt to lift the chassis with the handles on the power supplies, fan trays, or the switching modules. These handles are not designed to support the weight of the chassis. Using them to lift or support the chassis can result in severe damage to the equipment and serious bodily injury.** Statement 278

Warning **To prevent bodily injury when mounting or servicing this unit in a rack, you must take special precautions to ensure that the system remains stable. The following guidelines are provided to ensure your safety:**

—This unit should be mounted at the bottom of the rack if it is the only unit in the rack.

—When mounting this unit in a partially filled rack, load the rack from the bottom to the top with the heaviest component at the bottom of the rack.

—If the rack is provided with stabilizing devices, install the stabilizers before mounting or servicing the unit in the rack.

Warning **Class 1 laser product.**

Warning **Before performing any of the following procedures, ensure that power is removed from the DC circuits. To ensure that all power is removed, locate the circuit breakers or fuses on the DC power lines that service the DC circuits. Turn OFF the DC power line circuit breakers and remove the DC power line fuses.** Statement 322

Warning **Do not reach into a vacant slot or chassis while you install or remove a module or a fan. Exposed circuitry could constitute an energy hazard.** Statement 206

Warning **Blank faceplates and cover panels serve three important functions: they prevent exposure to hazardous voltages and currents inside the chassis; they contain electromagnetic interference (EMI) that might disrupt other equipment; and they direct the flow of cooling air through the chassis. Do not operate the system unless all cards, faceplates, front covers, and rear covers are in place.** Statement 1029

Warning **This equipment is intended to be grounded. Ensure that the host is connected to earth ground during normal use.** Statement 39

Warning **For personal safety, the ground wire must connect to safety (earth) ground at both the equipment and supply side of the DC wiring (unless the local electrical code requirements are different).** Statement 223

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Warning **Read the installation instructions before you connect the system to its power source.** Statement 1004

Warning **Before working on equipment that is connected to power lines, remove jewelry (including rings, necklaces, and watches). Metal objects will heat up when connected to power and ground and can cause serious burns or weld the metal object to the terminals.** Statement 43

Warning **Do not stare into the beam or view it directly with optical instruments.** Statement 29

Warning **Two people are required to lift the chassis. Grasp the chassis underneath the lower edge and lift with both hands. To prevent injury, keep your back straight and lift with your legs, not your back. To prevent damage to the chassis and components, never attempt to lift the chassis with the handles on the power supplies or on the interface modules. These handles were not designed to support the weight of the chassis.** Statement 52

Warning **Do not work on the system or connect or disconnect cables during periods of lightning activity.** Statement 1001

Warning **To prevent the system from overheating, do not operate it in an area that exceeds the maximum recommended ambient temperature of 104°F (40°C).** Statement 1047

Warning **Before working on a system that has an On/Off switch, turn OFF the power and unplug the power cord.** Statement 1

Warning **Never install an AC power module and a DC power module in the same chassis.** Statement 1050

Warning **Power off the unit before you begin.** Statement 237

Warning **Before working on a chassis or working near power supplies, unplug the power cord on AC units; disconnect the power at the circuit breaker on DC units.** Statement 12

Warning **Do not touch the power supply when the power cord is connected. For systems with a power switch, line voltages are present within the power supply even when the power switch is off and if the power cord is connected. For systems without a power switch, line voltages are present within the power supply when the power cord is connected.** Statement 4

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Warning **This unit might have more than one power supply connection; all connections must be removed completely for you to completely remove power from the unit.** Statement 124

Warning **Ultimate disposal of this product should be handled according to all national laws and regulations.** Statement 1040

Warning **This unit is intended for installation in restricted access areas. A restricted access area is where access can only be gained by service personnel through the use of a special tool, lock and key, or other means of security, and is controlled by the authority responsible for the location.** Statement 37

Warning **This product requires short-circuit (overcurrent) protection, to be provided as part of the building installation. Install only in accordance with national and local wiring regulations.**Statement 1045

Warning **Use copper conductors only.** Statement 1025

Warning **During this procedure, wear grounding wrist straps to avoid ESD damage to the card. Do not directly touch the backplane with your hand or any metal tool, or you could shock yourself.** Statement 94

Working Safely with Electricity

Follow these guidelines when working on equipment powered by electricity:

- Locate the emergency power-off switch for the room in which you are working. Then, if an electrical accident occurs, you can act quickly to turn off the power.
- Disconnect all power by removing the fuses from the fuse and alarm panel before you:
  - Install or remove a switch
  - Work near power supplies
- Do not work alone if potentially hazardous conditions exist.
- Never assume that power is disconnected from a circuit; always check the circuit.
- Look carefully for possible hazards in your work area, such as moist floors, ungrounded power extension cables, frayed power cords, and missing safety grounds.
- If an electrical accident occurs and someone is injured, proceed as follows:
  - Use caution; do not become a victim yourself.
  - Turn off power to the system.
  - If possible, send another person to get medical aid. Otherwise, assess the condition of the victim and then call for help.
  - Determine if the person needs rescue breathing or external cardiac compressions; then take appropriate action.

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- Use the Cisco MGX AC and DC systems within the specifications provided by their marked electrical ratings and product usage instructions.
- Install the Cisco MGX AC and DC systems with the following local, national, or international electrical codes:
  - United States—National Fire Protection Association (NFPA70), United States National Electrical Code
  - Canada—Canadian Electrical Code, Part 1, CSA C22.1
  - Other countries—International Electromechanical Commission (IEC) 364, Part 1 through Part 7
- AC models of Cisco MGX systems are shipped with a 3-wire electrical cord with a grounding-type plug that fits only a grounding-type power outlet. This is a safety feature that you should not circumvent. Equipment grounding should comply with local and national electrical codes.

DC Power Guidelines for MGX Switches

Only a DC power source that complies with the safety extra low voltage (SELV) requirements of UL 1950, CSA C22.2 No. 950-95, EN 60950, and IEC 950 can be connected to a DC PEM in the MGX 8850 or MGX 8850/B switch.

MGX 8850 or MGX 8850/B switches equipped with DC PEM(s) are intended for installation only in a restricted access location. In the United States, a restricted access area is one that meets the specifications in Articles 110-16, 110-17, and 110-18 of the National Electrical Code ANSI/NFPA 70.

MGX 8850 and MGX 8850/B DC Amp Requirements

DC models for MGX 8850 and MGX 8850/B switches are equipped with DC power entry modules (PEMs) and require you to terminate the DC input wiring on a DC source capable of supplying at least 60 A. A 60 A circuit breaker is required at the –48 VDC facility power source.

MGX 8950 DC Amp Requirements

DC models of MGX 8950 switches are equipped with DC power entry modules (PEMs) and require you to terminate the DC input wiring on a DC source capable of supplying at least 100 A. A 100 A circuit breaker is required at the –48 VDC facility power source.

MGX 8830 and MGX 8830/B DC Amp Requirements

DC models of MGX 8830 or MGX 8830/B systems are equipped with DC power entry modules (PEMs) and require you to terminate the DC input wiring on a DC source capable of supplying at least 30 A. A 30 A circuit breaker is required at the –48 VDC facility power source.

Caution An easily accessible disconnect device should be incorporated into the facility wiring. Be sure to connect the grounding wire conduit to a solid earth ground. Use of a closed loop ring is recommended for terminating the ground conductor at the ground stud.

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Preventing ESD Damage

Proper ESD protection is required whenever you handle Cisco equipment. ESD damage, which can occur when electronic cards or components are improperly handled, results in complete or intermittent failures. Use an antistatic strap when you are handling equipment. The Cisco MGX switch ships with an antistatic wrist strap kit, which you should use when you are handling cards or components. When used, the strap grounds the user and protects the electronic components from electrostatic shock.

Note The building where you are working should provide enough grounding to prevent damage from electrostatic discharge. For details, see the "Bonding and Grounding the Cisco MGX System" section on page C-8.

Follow these guidelines to prevent ESD damage:

- Always use an ESD grounding strap and ensure that it makes good skin contact. Put the strap on before handling any cards or modules.
- Connect the equipment end of the strap to the rack or to the ESD jack located in your chassis.
- When you install a component, use available ejector levers or captive installation screws to properly seat the bus connectors in the backplane or midplane. These devices prevent accidental removal, provide proper grounding for the system, and help ensure that bus connectors are properly seated.
- When you remove a component, use available ejector levers or captive installation screws to release the bus connectors from the backplane or midplane.
- Handle the cards and modules by the edges only; avoid touching the printed circuit boards or connectors.
- Place a removed board component-side-up on an antistatic surface or in a static-shielding container. If you plan to return the component to the factory, immediately place it in a static-shielding container.
- Avoid contact between the printed circuit boards and clothing. The wrist strap protects components from ESD voltages on the body only; ESD voltages on clothing can still cause damage.

The building where you are working should provide adequate grounding to prevent damage from electrostatic discharge.

Caution Periodically check the resistance value of the antistatic strap. Ensure that the measurement is between 1 and 10 megohms.

The antistatic wrist strap kit consists of a strap, a coiled cord, and a clip for holding the strap. It is recommended that you install the base of the antistatic wrist strap cable on the left front flange of one of the switches at a convenient height. Complete the following steps to attach the antistatic wrist strap:

Step 1 Use a front mounting screw and a screwdriver to secure the ring lug to the flange and front rail. The other end of the cord connects to the strap with a snap connector.

Step 2 Peel the back off the clip to expose the adhesive surface and attach the clip to the front of the unit above the ring lug.

Step 3 Mount the clip sideways so that the strap does not interfere with the removal of cards. Use the clip to store the strap.

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General Card Installation Guidelines

This section contains recommendations and precautions for:

- Installing and replacing cards and modules
- Hot swapping cards and modules
- Card installation

Card Installation and Replacement Suggestions

The following are examples of recommended installation and replacement practices for cards and modules.

Caution Any card or module that is only partially connected to the backplane can disrupt system operation.

- Do not force the card or module into its slot. This action can damage the pins on the backplane if they are not aligned properly with the card or module.
- Ensure that the card or module is straight and not at an angle when you install it in the slot. Installing the card or module at an angle can damage it. Use the guide rails to install the card or module correctly.
- Fully depress the levers to ensure that the card or module connector mates with the backplane correctly.

Caution Refer to "How Most Card Levers Work" section on page 6-5 for how to open latches or extractor levers on cards. **Do not force latches open!**

Hot Swapping Cards and Modules

Hot swapping allows you to remove and replace cards without disconnecting system power. Cisco MGX switches support hot swapping of cards and modules.

Note Hot swapping a card interrupts service only when the card set is operating in standalone mode, or when the card is operating in redundancy mode and the wrong card is pulled.

Card Installation Guidelines

Before you install a front or back card, be sure to follow these guidelines:

- Inspect the backplane for bent pins or bent dividers between pin rows (see Figure 3-1). If the backplane has bent pins, do not install a card in that slot. Installing a card in a damaged backplane slot damages the connector on the card.

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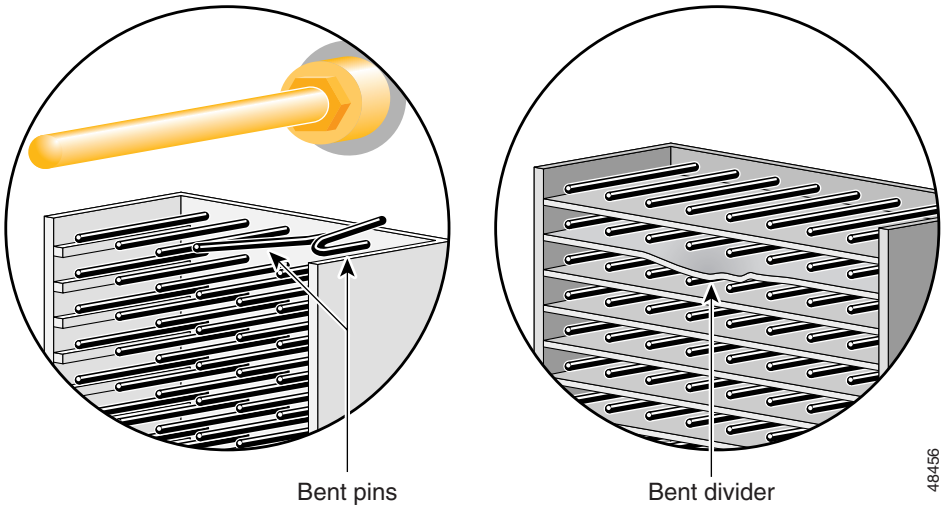
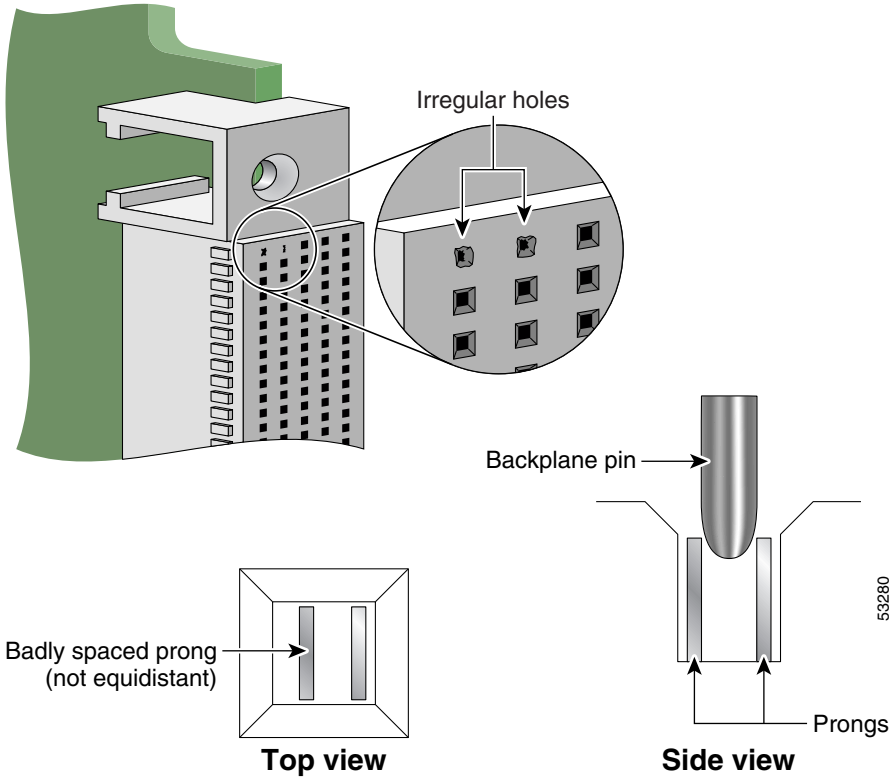
Figure 3-1 Backplane Inspection Check Points



- Inspect the card for irregular holes or off-center pin insertion prongs on the connector (see Figure 3-2). If the connector has irregular holes or off-center prongs, do not install the card. Installing a card that has a damaged connector damages the backplane.

Figure 3-2 Damaged Connectors on Card



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Caution PXM45 controller cards go in slots 7 and 8 on the MGX 8850 (PXM45), MGX 8850/B (PXM45), or MGX 8950 switch.

PXM1E controller cards go in slots 7 and 8 on the MGX 8850 (PXM1E) or MGX 8850/B (PXM45) switch.

PXM1E controller cards go in slots 1 and 2 on the MGX 8830 or MGX 8830/B switch.

Do not insert controller cards into any other slots. All other slots have a guide pin where the controller card slots do not. If you push a controller card into an incorrect slot, the guide pin will break the electrical edge connector on the controller card. It does not take much force for this to happen. Then, if the controller card, which now has a broken edge connector, is inserted into the correct controller card slot, the broken edge connector will cause further damage by bending pins on the backplane.

How Cisco MGX Systems are Shipped

In general, the MGX switch systems, if shipped assembled, are “ready to go” when removed from the box. Each system comprises the chassis, intake plenum, exhaust plenum, fans, power supplies, and cables. The cards are already installed in the chassis. The power supplies are installed in the intake plenum. The customer would need to place the various rack-mounted parts in a specific order, which is described in the remainder of this chapter for each switch.

The STRAT-M cabinet is an older model cabinet. It is ordered with the chassis “ready to go” or the cabinet by itself.

Each component can be purchased individually as a spare.

Site Requirements for the MGX 8850 or MGX 8850/B Switch

This section describes requirements for the site where the MGX 8850 or MGX 8850/B switch is to be installed. Before you install the switch, ensure that all of the criteria in this section are met.

Table 3-1 summarizes the space, weight, and power requirements for the switch. Specifications are described in greater detail in the following sections:

- Environmental Requirements, page 3-11
- Power Requirements, page 3-17

Table 3-1 lists the physical specifications for the Cisco MGX 8850 or MGX 8850/B switch.

Note One rack unit (RU) is equal to 1.75 inches (4.45 cm).

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Table 3-1 Space, Weight, and Power Specifications for the Cisco MGX 8850 or MGX 8850/B System

Specification		Description
Dimensions **Note** Racks must have 17.75 in. minimum between mounting rails.	DC-powered system	17 RUs Height: 29.75 in. (75.56 cm) Width: 19 in. (48.26 cm) Depth: 21.5 in. (54.6 cm)—Excluding cable management and front door
	AC-powered system	20 RUs Height: 35 in. (88.9 cm) Width: 19 in. (48.26 cm) Depth: 21.5 in. (54.61 cm)—Excluding cable management and front door
Weight	DC-powered switch	Up to 190 lb. (86.26 kg)
	AC-powered switch	Up to 250 lb. (113.5 kg)
Shipping weight for individual components		Front and back cards: 6.0 lb. (2.72 kg) per card set Card cage with cards: 160 lb. (72.64 kg) Exhaust plenum: 8 lb (3.63 kg) Fan tray: 9.5 lb (4.3 kg) Air intake plenum: 8 lb (3.63 kg) AC power supply tray with power supplies: 45 lb. (20.43 kg) APS connector: 1 lb (0.45 kg)
Clearance requirement for the enclosure		Minimum 30 in. front and rear; 12 in. side clearance recommended
Power input voltage		• AC source: Requires 220 VAC. Normal operating range is 200 to 240 VAC, 47 to 63 Hz. The maximum voltage range is 180 to 254 VAC. **Note** The AC power source must be within 6 feet (1.8 meters) of the system and easily accessible. • DC source: –42 to –56 VDC.
AC system current requirements		Configuration-dependent: Use Table 3-6 for exact requirements. For general planning purposes: 14.4 A at a nominal voltage of 200 VAC. At the minimum voltage limit of 180 VAC, the current draw is a maximum of 16 A.
DC system current requirements		Configuration-dependent: Use Table 3-6 for exact requirements. For general planning purposes: 50 A at nominal –48 VDC; 57.1 A at –42 VDC maximum.

Environmental Requirements

Proper operation of an MGX 8850 or MGX 8850/B switch depends on a proper environment. This section describes environmental requirements for the site where you intend to install the switch.

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The following sections are included:

- Seismic Anchoring, page 3-12
- Shock, page 3-12
- Vibration, page 3-12
- Space, page 3-13
- Temperature, Altitude, and Humidity, page 3-15
- Ventilation, page 3-16

Seismic Anchoring

In order for you to secure a Cisco-supplied cabinet, the holes in the upper and lower corners accommodate 3/8-inch or 1/2-inch bolts. Also, you can buy an optional stability plate with the Cisco cabinet. The stability plate is bolted to the floor, and then the Cisco cabinet is bolted to the stability plate. See Chapter 5, "Installing the Cisco MGX Switch or Gateway" for stability plate installation instructions.

Shock

For nonoperating mechanical shock and for equipment weighing more than 100 pounds, the peak acceleration will be from 20 to 25 G.

For operating mechanical shock, the minimum velocity change is 0.66 meters per second with an effective free fall drop height of 13 mm for Mechanical Design Validation Test (MDVT) and an effective free fall drop height of 25 mm for Network Equipment Building Standards (NEBS) with no velocity change specified.

Vibration

Table 3-2 describes the Cisco recommendations for vibration conditions.

Table 3-2 Vibration Condition Recommendations

Category	NEBS Description	MDVT Description
Office	• 3 axis swept-sine. • 5 Hz to 100 Hz to 5 Hz. • 0.1 G, 0.1 octaves/min.	• 0.41 Grms, 3 to 500 Hz • Spectral break points of 0.0005 G^1/Hz at 10 Hz and 200 Hz • 5 dB/octave roll-off at each end • 2 hrs per axis of operation
Transportation	• For rail, truck, ship, 5 to 100 Hz, 0.1 octave/min, 0.5 G. • For rail, truck, ship, jet, reciprocating or turbo prop aircraft, 100 to 500 Hz, 0.25 octave/min, 1.5 G.	• 3 to 300 Hz, 0.5 G^2 • 30 min per axis[2]

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Table 3-2 Vibration Condition Recommendations (continued)

Category	NEBS Description	MDVT Description
Non-Operational	• None.	• 1.12 Grms, 3 to 500 Hz • Spectral break points of 0.0065 G^1/Hz at 10 Hz and 100 Hz • 5 dB/octave roll-off at each end • 30 minutes in each of 3 axes
Earthquake	• No damage to the switch when tested to earthquake waveform. • 75-mm maximum single amplitude deflection. • Frame-level natural mechanical resonant frequency > 2 Hz. • Frame-level natural mechanical resonant frequency > 6 Hz. • Product must function before and after vibration is applied to each axis (x = side to side, y = front to back, z = up and down). • Product must operate without loss of service during earthquake testing.	• None

1. Office product—More than 2 m from regularly inhabited positions
2. Cisco package test specification

Space

You can install the following MGX 8850 or MGX 8850/B system components in a rack (as shown in Figure 3-3):

- Exhaust plenum
- Upper fan tray
- Cisco MGX 8850 switch
- Lower fan tray
- Air intake plenum
- AC power supply tray (optional)

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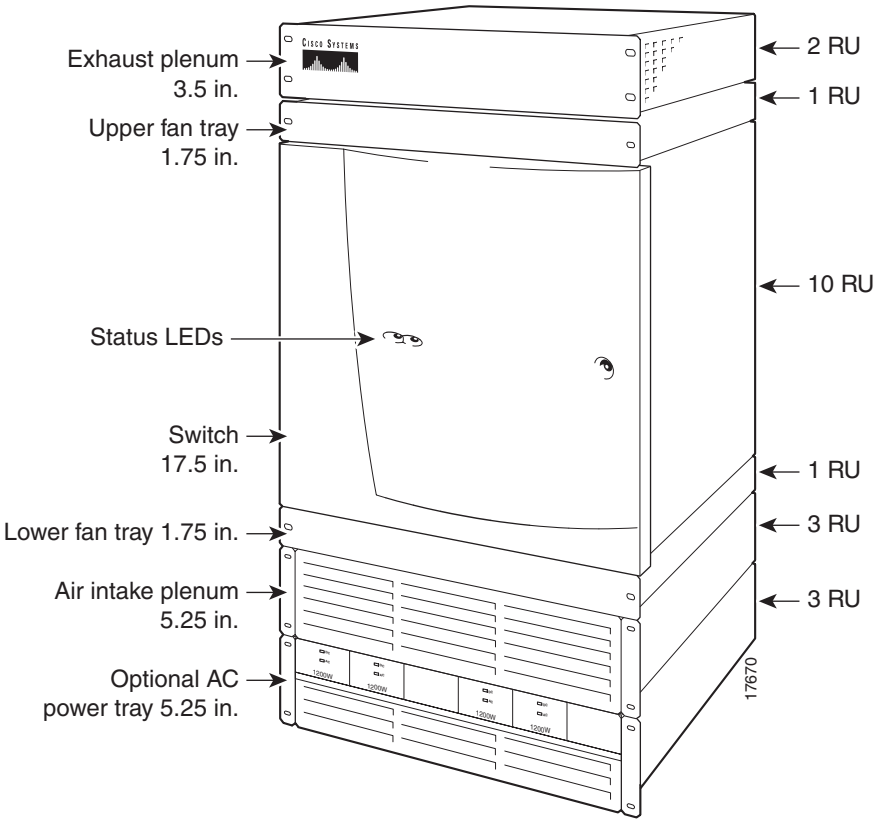
Figure 3-3 MGX 8850 or MGX 8850/B Switch Components



The MGX 8850 or MGX 8850/B switch and components fit in either a 19-inch (48.26 cm) wide rack or a 23-inch (58.42 cm) wide rack (with extenders installed). See Table 3-3 for component space requirements within the rack.

Table 3-3 MGX 8850 or MGX 8850/B Rack Space Requirements

Component	Rack Space	Height	Depth
Exhaust plenum	2 RUs	3.50 in. (8.89 cm)	21.5 in. (54.61 cm)
Upper fan tray	1 RU	1.75 in. (4.45 cm)	21.5 in. (54.61 cm)
Cisco MGX 8850 switch	10 RUs	17.5 in. (44.45 cm)	21.5 in. (54.61 cm)
Lower fan tray	1 RU	1.75 in. (4.45 cm)	21.5 in. (54.61 cm)
Air intake plenum	3 RUs	5.25 in. (13.34 cm)	21.5 in. (54.61 cm)
AC power supply tray (optional)	3 RUs	5.25 in. (13.34 cm)	21.5 in. (54.61 cm)

Plan so that the rack accommodates your needs. An AC-powered MGX 8850 or MGX 8850/B switch occupies 35.00 inches (88.9 cm or 20 RUs) of vertical space. A DC-powered MGX 8850 or MGX 8850/B switch occupies 29.75 inches (75.69 cm or 17 RUs) of vertical space.

Note In a central office (CO) and private enterprise (PE) environment, the total amount of rack space should not exceed 42 RUs. If your total configuration exceeds 42 RUs, either replan your configuration or use more than one rack to house the MGX 8850 or MGX 8850/B switch components.

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The location of the Cisco MGX switch and the layout of your rack or wiring room are extremely important for proper system operation. If equipment items are too close together, ventilation might be inadequate, and panels might become inaccessible. As a result, the system might malfunction or even shut down, and maintenance and repair are made more difficult.

A Cisco MGX switch requires access space around the cabinet. The suggested clearance at the front and the back of the cabinet is 30 inches (76.20 cm). The suggested clearance on each side of the cabinet is 12 inches (30.48 cm).

Note A vertical gap of 0.047 to 0.077 inch (0.119 to 0.196 cm) or about 1/16 inch must exist between adjacent modules to allow for module removal.

Position the switch so that it does not interfere with the routing of cables and the termination of telephone or carrier circuits. Raised flooring is recommended so that there is enough space under the flooring for cables and wiring.

When planning your site layout and equipment locations, keep in mind the precautions that are described in the "Safety Requirements" section on page 3-2 and the "Site Requirements for the MGX 8850 or MGX 8850/B Switch" section on page 3-10. These precautions can help you to avoid equipment failures and can reduce the possibility of environmentally caused shutdowns. If you are currently experiencing shutdowns or unusually high error rates with your existing equipment, these precautions might help you isolate the cause of failures and prevent future problems.

Temperature, Altitude, and Humidity

The system can tolerate a wide range of temperatures. Table 3-4 provides the Cisco recommendations for temperature, altitude, and humidity conditions in a CO and PE environment.

Table 3-4 CO and PE Operating Environment Requirements

Environmental Specification	Description
Temperature	32 to 104ºF (0 to 40ºC)—Normal operation 68 to 86ºF (20 to 30ºC)—Recommended operation[1]
Altitude	–197 to 13124 feet (–60 to 4000 meters)
Humidity	Up to 85% (noncondensing)

1. The switch can run up to 122ºF (50ºC) for up to 72 hours.

An AC-powered MGX 8850 or MGX 8850/B switch dissipates up to 9560 Btus (2.8 kW) per hour, and a DC-powered MGX 8850 or MGX 8850/B switch dissipates up to 8200 Btus (2.4 kW) per hour.

Warning **To prevent the system from overheating, do not operate it in an area that exceeds the maximum recommended ambient temperature of 104°F (40°C).** Statement 1047

Note Electrical equipment generates heat. Ambient air temperature might not be able to cool equipment to acceptable operating temperatures without adequate circulation. Ensure that the room in which you operate your system has adequate air circulation.

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Enclosed racks must have adequate ventilation. Ensure that the rack is not overly congested, because each unit generates heat. An enclosed rack should have louvered sides and a fan to provide cooling air.

The enclosure must also provide adequate cooling through the use of an appropriately sized heat exchanger or air conditioner, which dissipates the heat generated by existing remote terminal system components and by the installed switch.

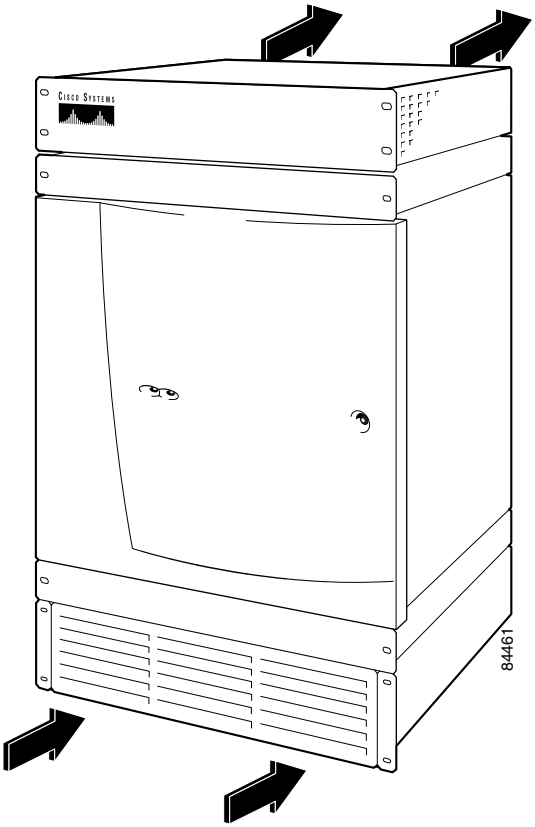
Ventilation

The following practices ensure proper ventilation for the MGX 8850 or MGX 8850/B switch:

- Install two fan trays within the switch: an upper and a lower fan tray
- Install an air intake plenum and an exhaust plenum within the switch

The main air intake vents are located in the air intake plenum component, which is installed under the switch. The air intake vent for the AC power supply tray is located on the front of the power supply tray panel. All air exhaust vents are located at the rear of the exhaust plenum component. Ensure that the intake and exhaust vents are not obstructed in any way. Figure 3-4 shows the air flow through the switch.

Figure 3-4 Air Flow Through Intake and Exhaust Vents for the MGX 8850 or MGX 8850/B Switch



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Enclosed racks must have adequate ventilation. Ensure that the rack is not overly congested, because each unit generates heat. An enclosed rack should have louvered sides and a fan to provide cooling air.

The enclosure must also provide adequate cooling through the use of an appropriately sized heat exchanger or air conditioner, which dissipates the heat generated by existing remote terminal system components and by the installed switch.

Power Requirements

The system can accept power from either an optional AC source (AC power supply tray) or a DC source (DC PEM). Table 3-5 details the power specifications for both the AC and DC sources.

Table 3-5 Power Specifications for the MGX 8850 or MGX 8850/B Switch

Specification	Description
Power input voltage	• AC source: Requires 220 VAC. Normal operating range is 200 to 240 VAC, 47 to 63 Hz. The maximum voltage range is 180 to 254 VAC. **Note** The AC power source must be within 6 feet (1.8 meters) of the system and easily accessible. • DC source: –42 to –56 VDC.
AC system current requirements	Configuration-dependent: Use Table 3-6 for exact requirements. For general planning purposes: 14.4 A at a nominal voltage of 200 VAC. At the minimum voltage limit of 180 VAC, the current draw is a maximum of 16 A.
DC system current requirements	Configuration-dependent: Use Table 3-6 for exact requirements. For general planning purposes: 50 A at nominal –48 VDC; 57.1 A at –42 VDC maximum.
Input AC power connector	IEC 320-type C19 (20 A North American, 16 A International) input connector. For a list of the AC power plugs for domestic and international use, see the Table 3-7 on page 3-26.
DC input connections	Three-position terminal block for 6 AWG wire (10 square millimeters), no. 10 screw lugs designed for 6 AWG wire and Panduit (part number LC AS6-10-L). The customer-supplied wire must be terminated with a terminal lug that accepts no. 10-32 screws.

Warning **This unit is intended for installation in restricted access areas. A restricted access area is where access can only be gained by service personnel through the use of a special tool, lock and key, or other means of security, and is controlled by the authority responsible for the location.** Statement 37

Note In the United States, restricted access is defined in Articles 10-116, 10-117, and 10-118 of the National Electrical Code ANSI/NFPA 70.

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The following sections provide additional information about power:

- AC Power, page 3-18
- DC Power, page 3-19
- Power Consumption Calculation Tables, page 3-20

AC Power

AC power is supplied to the MGX 8850 or MGX 8850/B switch through the AC power supply tray. AC power sources must be dedicated AC branch circuits.

Each branch circuit must be protected by a dedicated two-pole circuit breaker. The circuit breakers at the source must have a rated trip delay time greater than those of the MGX 8850 switch circuit breaker with a medium trip delay.

The MGX 8850 or MGX 8850/B switch uses a 20-A, 2-pole circuit breaker for each AC input. It is recommended that the site have a 20-A, 2-pole AC circuit breaker with a long trip delay at each branch circuit.

Note For more information about the AC power supply tray, see the "AC Power Supply Tray" section on page 1-25.

Tip Check the power at your site to ensure that you are receiving "clean" power (free of spikes and noise). Install a power conditioner if necessary.

Caution Consult Cisco Customer Service if the plans for the system's AC power include an uninterruptible power source (UPS). It is recommended that you use a UPS with a low output impedance and the capacity to provide the necessary fault current to trip the protection devices. If the UPS cannot provide the fault current, the UPS must be equipped with a fault bypass switch that can trip the protection devices through the utility power. Do not use a UPS or any power source with a Ferro-Resonant transformer.

Caution For mission-critical applications, it is recommended that you use the dual AC power input tray with dual AC power cords, so that there can be no single or primary power failure.

The power receptacles to which the switch connects must be of the grounding type. The grounding conductors that connect to the receptacles should connect to protective earth at the service equipment. Figure 3-5 shows the hookup schematic in the three-wire wall plug.

For AC power cord details (part numbers and countries), see Table 3-7 on page 3-26.

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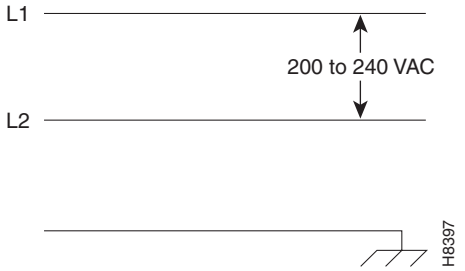
Figure 3-5 Schematic of AC Plug Wiring



DC Power

DC power is supplied to the MGX 8850 or MGX 8850/B switch through one or two DC PEMs. Each DC PEM must be connected to a dedicated 60-A regulated source.

Each branch circuit must have a 60-A circuit breaker at the source. Wires connecting the PEMs to the sources should be capable of carrying 60 A. A 6-AWG (10-square mm) copper wire is recommended. Consult the local or national codes for conductor sizing for DC supply connections if necessary.

Note For more information about the DC PEM, see the "DC Power Entry Module" section on page 1-30.

DC power sources must be dedicated DC branch circuits. Each branch circuit must be protected by a dedicated circuit breaker.

The circuit breaker must have a rated trip delay time greater than that of the MGX 8850 or MGX 8850/B switch circuit breaker. The switch uses a 60-A, 1-pole circuit breaker with a short trip delay on each –48 V input. It is recommended that the site have a dedicated 60-A, 1-pole circuit breaker with a medium trip delay at each branch circuit.

Connect the safety grounding wire to a solid earth ground. It is recommended that you use a ring terminal lug to terminate the ground conductor at the ground stud. For details, see the "Bonding and Grounding the Cisco MGX System" section on page C-8.

Caution The –48 VDC return, logical grounds, and safety grounds are connected to the equipment chassis; therefore, you must use a low-impedance connector to connect the chassis ground to the earthing ground.

Note Connect the MGX 8850 or MGX 8850/B switch only to a –48 VDC source that complies with the SELV requirements in UL 1950, IEC 950, EN 60950, and CSA C22.2 No. 950-95.

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Power Consumption Calculation Tables

You can use Table 3-6 to calculate the typical power requirement for a MGX 8850 (PXM45/PXM1E) or MGX 8850/B switch.

Table 3-6 Power Consumption Calculation for MGX 8850 or MGX 8850/B Switch Components

Front Card	A Number of Cards Installed	B Watts per Card	C Total Card Power (AxB)	D Total 48-V Current (ADC) (C/48)
AUSM-8E1/B		28.22		
• MGX-RJ48-8E1		3		
• RJ48-8E1		3		
• R-RJ48-8E1		3		
• SMB-8E1		5		
• R-SMB-8E1		5		
AUSM-8T1/B		28.22		
• RJ48-8T1		3		
• R-RJ48-8T1		3		
AXSM-1-2488		85.8		
• SMFLR-1-2488		19.4		
• SMFSR-1-2488		19.4		
• SMFXLR-1-2488		19.4		
AXSM-1-2488/B		85.8		
• SMFLR-1-2488/B		19.4		
• SMFSR-1-2488/B		19.4		
• SMFXLR-1-2488/B		19.4		
AXSM-2-622-E		80		
• SMFIR-1-622/C		12		
• SMFLR-1-622/C		12		
AXSM-4-622		94.6		
• SMFIR-2-622		12		
• SMFLR-2-622		12		
AXSM-4-622/B		94.6		
• SMFIR-2-622/B		12		
• SMFLR-2-622/B		12		

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Table 3-6 Power Consumption Calculation for MGX 8850 or MGX 8850/B Switch Components (continued)

Front Card	A Number of Cards Installed	B Watts per Card	C Total Card Power (AxB)	D Total 48-V Current (ADC) (C/48)
AXSM-8-155-E		80		
• MMF-4-155/C		21.3		
• SMB-4-155		25		
• SMFIR-4-155/C		12		
• SMFLR-4-155/C		12		
AXSM-16-155		94.6		
• MMF-8-155-MT		21.3		
• SMFIR-8-155-LC		12		
• SMFLR-8-155-LC		12		
AXSM-16-155/B		94.6		
• MMF-8-155-MT/B		21.3		
• SMB-4-155		25		
• SMFIR-8-155-LC/B		12		
• SMFLR-8-155-LC/B		12		
AXSM-16-155-XG		185		
• MCC-8-155		19.8		
• SFP-8-155		13.3		
AXSM-16-T3E3		94.6		
• SMB-8-E3		10		
• SMB-8-T3		10		
AXSM-16-T3E3/B		94.6		
• SMB-8-E3		10		
• SMB-8-T3		10		
AXSM-16-T3E3-E		80		
• SMB-8-E3		10		
• SMB-8-T3		10		
AXSM-32-T1E1-E		110		
• MCC-16-E1		5		
• RBBN-16-T1E1		5		
CESM-8E1		29.1		
• MGX-RJ48-8E1		3		
• RJ48-8E1		3		
• R-RJ48-8E1		3		

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Table 3-6 Power Consumption Calculation for MGX 8850 or MGX 8850/B Switch Components (continued)

Front Card	A Number of Cards Installed	B Watts per Card	C Total Card Power (AxB)	D Total 48-V Current (ADC) (C/48)
• SMB-8E1		5		
• R-SMB-8E1		5		
CESM-8T1 and CESM-8T1/B		29.1		
• RJ48-8T1		3		
• R-RJ48-8T1		3		
FRSM-2CT3		49		
• BNC-2T3		5		
FRSM-2T3E3		30		
FRSM-8E1		25.84		
• MGX-RJ48-8E1		3		
• RJ48-8E1		3		
• R-RJ48-8E1		3		
• SMB-8E1		5		
• R-SMB-8E1		5		
FRSM-8E1-C		25.84		
• MGX-RJ48-8E1		3		
• RJ48-8E1		3		
• R-RJ48-8E1		3		
• SMB-8E1		5		
• R-SMB-8E1		5		
FRSM-8T1		25.84		
• RJ48-8T1		3		
• R-RJ48-8T1		3		
FRSM-8T1-C		25.84		
• RJ48-8T1		3		
• R-RJ48-8T1		3		
FRSM-12-T3E3		100.3		
• SMB-6-T3E3		9		
FRSM-HS2/B		46.4		
• 12IN1-8S		2		
• SCSI2-2HSSI/B		15		
MPSM-8-T1E1		36.3		

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Table 3-6 Power Consumption Calculation for MGX 8850 or MGX 8850/B Switch Components (continued)

Front Card	A Number of Cards Installed	B Watts per Card	C Total Card Power (AxB)	D Total 48-V Current (ADC) (C/48)
• RJ48-8T1		3		
• R-RJ48-8T1		3		
• MGX-RJ48-8E1		3		
• RJ48-8E1		3		
MPSM-16T1E1		40		
• MCC-16-T1E1-1N		8		
• RBBN-16-T1E1-1N		8		
• RED-16-T1E1		8		
MPSM-T3E3-155		50		
• BNC-3-T3E3-Y		4		
• SFP-2-155-1		9		
• SMB-2-155-EL		10		
PXM1E-4-155		87		
• PXM-UI-S3 or PXM-UI-S3/B		4		
• MMF-4-155/C		21.3		
• SMFIR-4-155/C		12		
• SMFLR-4-155/C		12		
PXM1E-8-155		97		
• PXM-UI-S3/B		4		
• MCC-8-155		23		
• SFP-8-155		7		
PXM1E-8-T3E3		85.4		
• PXM-UI-S3 or PXM-UI-S3/B		4		
• SMB-8-T3		10		
• SMB-8-E3		10		
PXM1E-16-T1E1		87		
• PXM-UI-S3/B		3		
• MCC-16-E1		5		
• RBBN-16-T1E1		5		
PXM1E-T3E3-155		96		
• PXM-UI-S3 or PXM-UI-S3/B		4		

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Table 3-6 Power Consumption Calculation for MGX 8850 or MGX 8850/B Switch Components (continued)

Front Card	A Number of Cards Installed	B Watts per Card	C Total Card Power (AxB)	D Total 48-V Current (ADC) (C/48)
• T3E3-155		10		
PXM45 or PXM45/B PXM45/C		101 121		
• PXM-UI-S3		4		
• PXM-HD		9		
RPM-PR-256		44		
• MMF-FE		3.03		
• RJ45-4E/B		1.25		
• RJ45-FE		3.03		
RPM-PR-512		45		
• MMF-FE		3.03		
• RJ45-4E/B		1.25		
• RJ45-FE		3.03		
RPM-XF-512		85		
• MGX-XF-UI		3		
• MGX-1OC12POS-IR		13		
• MGX-1GE		11		
• MGX-2OC12POS-IR		15		
• MGX-2GE		13		
SRM-3T3/C		25.24		
• BNC-3T3-M		4		
SRME		32		
• SMFIR-1-155		4.1		
• STM1-EL-1		6.3		
SRME/B		27.5		
• SMFIR-1-155		4.1		
• STM1-EL-1		6.3		
VISM-PR-8E1		60		
• MGX-RJ48-8E1		3		
• RJ48-8E1		3		
• R-RJ48-8E1		3		
• SMB-8E1		5		
• R-SMB-8E1		5		

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Table 3-6 Power Consumption Calculation for MGX 8850 or MGX 8850/B Switch Components (continued)

Front Card	A Number of Cards Installed	B Watts per Card	C Total Card Power (AxB)	D Total 48-V Current (ADC) (C/48)
VISM-PR-8T1		60		
• RJ48-8T1		3		
• R-RJ48-8T1		3		
VXSM-4-155		160		
• VXSM-BC-4-155		8		
• VXSM-R-BC		9		
VXSM-48T1E1		110		
• VXSM-BC-24T1E1 (used in pairs)		9		
VXSM-6-T3		154		
• VXSM-BC-3T3		6.3		
VXSM-3-3T3				
• VXSM-BC-3T3				
Fan tray (for each)		75.6		
DC PEM		20		
Totals				

Required Tools and Equipment

Table 3-7 lists the tools and equipment that you need to install and remove MGX 8850 or MGX 8850/B switch components.

Warning **Blank faceplates and cover panels serve three important functions: they prevent exposure to hazardous voltages and currents inside the chassis; they contain electromagnetic interference (EMI) that might disrupt other equipment; and they direct the flow of cooling air through the chassis. Do not operate the system unless all cards, faceplates, front covers, and rear covers are in place.** Statement 1029

Note For additional cabling requirements, see Appendix B, "Cable Specifications."

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Table 3-7 MGX 8850 or MGX 8850/B Required Tools and Equipment

Check	Tools and Equipment
	Hardware Components and Cables
	Cisco MGX 8850 or MGX 8850/B switches, with the front cards and back cards already installed
	If your configuration was not installed in a Cisco-supplied cabinet, you will need the following components for your system: • Cabinet or rack that meets the RETMA Standard EIA-310-D requirements • Upper and lower fan trays • Air intake plenum • Exhaust plenum • AC power supply tray with power supplies—for AC-powered systems • DC PEM—for DC-powered systems
	Blank front card faceplates, as needed: • Single-height service module: Cisco Part Number SINGLE SM-CVR • SRM: Cisco Part Number SRM-CVR • Double-height service module: Cisco Part Number DOUBLE SM-CVR • PXM45 or PXM1E: Cisco Part Number PROCESSOR CVR Back card blank faceplates, as needed: • For single-height back cards: Cisco Part Number 800-215911-00. **Warning** **Blank faceplates and cover panels serve three important functions: they prevent exposure to hazardous voltages and currents inside the chassis; they contain electromagnetic interference (EMI) that might disrupt other equipment; and they direct the flow of cooling air through the chassis. Do not operate the system unless all cards, faceplates, front covers, and rear covers are in place. Statement 1029**
	Mounting kit option for 23-inch rack: Cisco Part Number MGX-MNT23
	Cable management assembly: Cisco Part Number MGX-CAB-MGMT
	Switch earthing conductor—Minimum of 6 AWG stranded copper wire, rated at minimum 90°C
	APS connector, as necessary—Cisco Part Number MGX-8850-APS-CON or MGX-APS-CON
	Fan tray power cable
	DC PEM power cable—For DC-powered systems
	AC power supply tray power cable—For AC-powered systems

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Table 3-7 MGX 8850 or MGX 8850/B Required Tools and Equipment (continued)

Check	Tools and Equipment
	AC power cord for AC power supply tray, optional for AC power: • Argentina: Cisco Part Number CAB-ACR • Australia: Cisco Part Number PWRCD-ANZ • Continental Europe: Cisco Part Number PWRCD-EU • Great Britain: Cisco Part Number PWRCD-GBI • Ireland: Cisco Part Number PWRCD-GBI • Italy: Cisco Part Number PWRCD-IT • Japan: Cisco Part Number PWRCD-NA • New Zealand: Cisco Part Number PWRCD-ANZ • North America: Cisco Part Number PWRCD-NA (NEMA L6-20 twistlock plug)
	Wire for DC power connection—6 AWG (10 square mm) or larger three-wire solid or stranded copper wire with insulation rating for 140°F (60°C)
	Stability plate kit, optional—Cisco Part Number STRATM-STAB
	ESD protection equipment—Required whenever you handle Cisco equipment, which includes the switch, cards, and modules
	Mounting screws—To mount the Cisco MGX 8850 switch, upper fan tray, lower fan tray, air intake plenum, exhaust plenum, and optional AC power supply tray in the rack
	Tools
	Small- and medium-sized flat-blade screwdrivers
	Small- and medium-sized Phillips screwdrivers
	3-in-1 tool (part 700-07569-01) with the following heads: • A flat head for unlatching front card ejectors and loosening and tightening the back card captive screws • A hex head for unlatching the chassis door • A Phillips head for loosening and tightening the back card captive screws
	Power screwdriver, optional
	Wire stripper
	Wire-wrapping tool, optional
	Fuse replacement tool (218090-00). **Warning** **This tool should only be used by trained personnel.**

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Site Requirements for the MGX 8950 Switch

This section describes requirements for the site where the Cisco MGX 8950 switch is to be installed. Before you install the switch, ensure that all of the criteria in this section are met.

Table 3-8 summarizes the space, weight, and power requirements for the switch. Specifications are described in greater detail in the following sections:

- Environmental Requirements, page 3-29
- Required Tools and Equipment, page 3-39

Note One rack unit (RU) is equal to 1.75 inches (4.45 cm).

Table 3-8 Space, Weight, and Power Specifications for the MGX 8950 System

Specification		Description
Dimensions **Note** Racks must have 17.75 in. minimum between mounting rails.	DC-powered system	17 RUs Height: 29.75 in. (75.56 cm) Width: 19 in. (48.26 cm) Depth: 21.5 in. (54.6 cm)—Excluding cable management and front door
	AC-powered system	20 RUs Height: 35 in. (88.9 cm) Width: 19 in. (48.26 cm) Depth: 21.5 in. (54.6 cm)—Excluding cable management and front door
Weight	DC-powered switch	Up to 200 lb (90 kg)
	AC-powered switch	Up to 300 lb (136.5 kg)
Shipping weight for individual components		Front and back cards: 6.0 lb (2.72 kg) per card set Card cage with cards: 160 lb (72.64 kg) Exhaust plenum: 8 lb (3.63 kg) Fan tray: 9.5 lb (4.3 kg) Air intake plenum: 8 lb (3.63 kg) AC power supply tray with power supplies: 45 lb (20.43 kg) APS connector: 1 lb (0.45 kg)
Clearance requirement for the enclosure		Minimum 30 in. front and rear; 12 in. side clearance recommended
Power input voltage		• AC source: Normal operating range is 200 to 240 VAC, 47 to 63 Hz. The maximum voltage range is 180 to 254 VAC. **Note** The AC power source must be within 6 feet (1.8 meters) of the system and easily accessible. • DC source: –42 to –56 VDC.

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Table 3-8 Space, Weight, and Power Specifications for the MGX 8950 System (continued)

Specification	Description
AC system current requirements	Configuration-dependent: Use Table 3-12 for exact requirements. For general planning purposes: 14.4 A at a nominal voltage of 200 VAC. At the minimum voltage limit of 180 VAC, the current draw is a maximum of 21 A.
DC system current requirements	Configuration-dependent: Use Table 3-12 for exact requirements. For general planning purposes: 76 A (37.5 A per feed) at nominal -48 VDC; 86 A (43 A per feed) at -42 VDC minimum.

Environmental Requirements

Proper operation of the MGX 8950 switch depends on a proper environment. This section describes environmental requirements for the site where you intend to install the switch.

The following sections are included:

- Seismic Anchoring, page 3-29
- Vibration, page 3-30
- Space, page 3-30
- Temperature, Altitude, and Humidity, page 3-32
- Ventilation, page 3-33

Seismic Anchoring

In order for you to secure a Cisco-supplied cabinet, the holes in the upper and lower corners accommodate 3/8-inch or 1/2-inch bolts. Also, you can buy an optional stability plate with the Cisco cabinet. The stability plate is bolted to the floor, and then the Cisco cabinet is bolted to the stability plate. See Chapter 5, "Installing the Cisco MGX Switch or Gateway" for stability plate installation instructions.

Shock

For nonoperating mechanical shock and for equipment weighing more than 100 pounds, the peak acceleration will be from 20 to 25 G.

For operating mechanical shock, the minimum velocity change is 0.66 meters per second with an effective free fall drop height of 13 mm for Mechanical Design Validation Test (MDVT) and an effective free fall drop height of 25 mm for Network Equipment Building Standards (NEBS) with no velocity change specified.

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Vibration

Table 3-9 describes the Cisco recommendations for vibration conditions.

Table 3-9 Vibration Condition Recommendations

Category	NEBS Description	MDVT Description
Earthquake	• No damage to the switch when tested to earthquake waveform. • 75-mm maximum single amplitude deflection. • Frame-level natural mechanical resonant frequency > 2 Hz. • Frame-level natural mechanical resonant frequency > 6 Hz. • Product must function before and after each axis. • Product must operate without loss of service during earthquake testing.	• None
Office	• 3 axis swept-sine. • 5 Hz to 100 Hz to 5 Hz. • 0.1 G, 0.1 octaves/min.	• 0.41 Grms, 3 to 500 Hz • Spectral break points of 0.0005 G^1/Hz at 10 Hz and 200 Hz • 5 dB/octave roll-off at each end • 2 hrs per axis of operation
Transportation	• For rail, truck, ship, 5 to 100 Hz, 0.1 octave/min, 0.5 G. • For rail, truck, ship, jet, reciprocating or turbo prop aircraft, 100 to 500 Hz, 0.25 octave/min, 1.5 G.	• 3 to 300 Hz, 0.5 G^2 • 30 min per axis[2]
Non-Operational	• None.	• 1.12 Grms, 3 to 500 Hz • Spectral break points of 0.0065 G^1/Hz at 10 Hz and 100 Hz • 5 dB/octave roll-off at each end • 30 minutes in each of 3 axes

1. Office product—More than 2 m from regularly inhabited positions
2. Cisco package test specification

Space

You can install the following MGX 8950 system components in a rack (as shown in Figure 3-6):

- Exhaust plenum
- Upper fan tray
- Cisco MGX 8950 switch
- Lower fan tray

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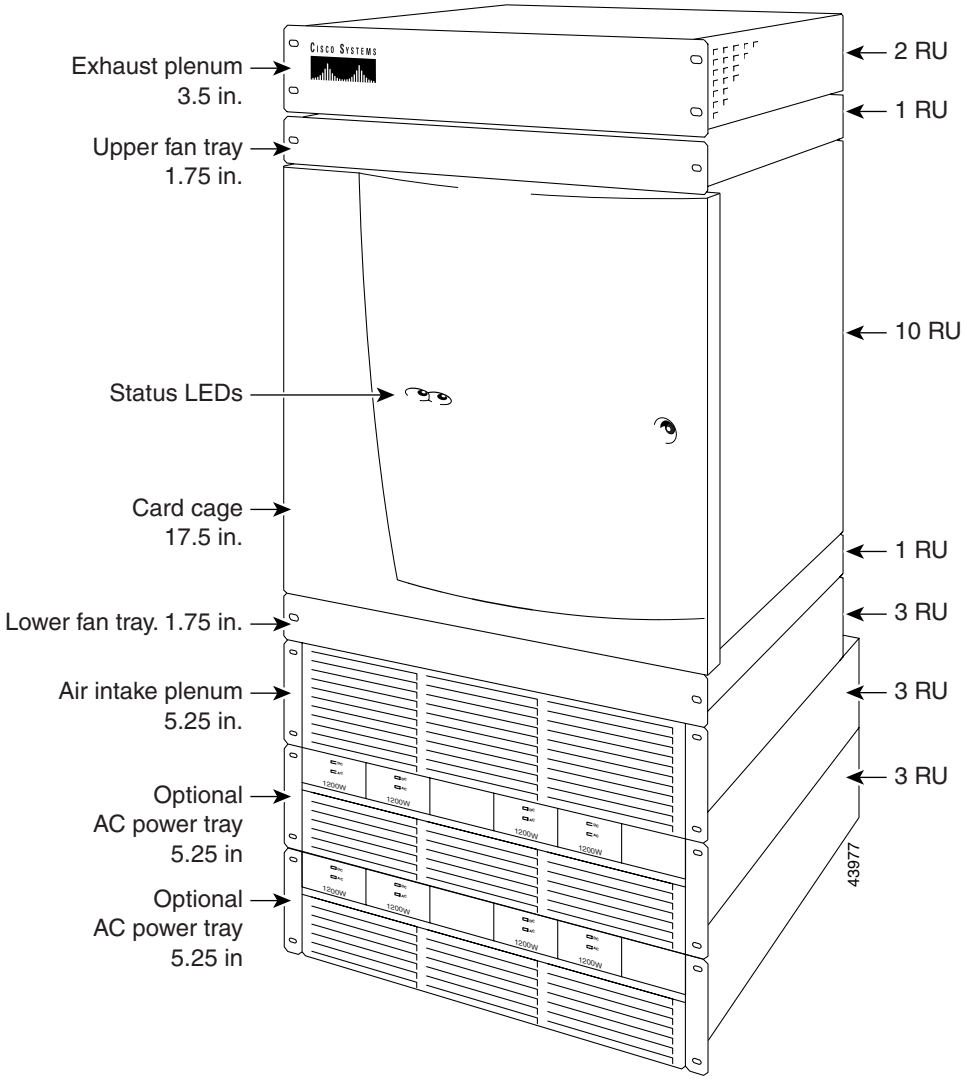
- Air intake plenum
- AC power supply tray (optional)

Figure 3-6 MGX 8950 Switch Components



The MGX 8950 switch and components fit in either a 19-inch (48.26 cm) wide rack or a 23-inch (58.42 cm) wide rack (with extenders installed). See Table 3-10 for component space requirements within the rack.

Table 3-10 MGX 8950 Rack Space Requirements

Component	Rack Space	Height	Depth
Exhaust plenum	2 RUs	3.50 in. (8.89 cm)	21.5 in. (54.61 cm)
Upper fan tray	1 RU	1.75 in. (4.45 cm)	21.5 in. (54.61 cm)
Cisco MGX 8950 switch	10 RUs	17.5 in. (44.45 cm)	21.5 in. (54.61 cm)
Lower fan tray	1 RU	1.75 in. (4.45 cm)	21.5 in. (54.61 cm)

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Table 3-10 MGX 8950 Rack Space Requirements (continued)

Component	Rack Space	Height	Depth
Air intake plenum	3 RUs	5.25 in. (13.34 cm)	21.5 in. (54.61 cm)
AC power supply tray (optional)	3 RUs	5.25 in. (13.34 cm)	21.5 in. (54.61 cm)

Plan so that the rack accommodates your needs. An AC-powered MGX 8950 switch occupies 35.00 inches (88.9 cm or 20 RUs) of vertical space. A DC-powered MGX 8950 switch occupies 29.75 inches (75.69 cm or 17 RUs) of vertical space.

Note In a central office (CO) and private enterprise (PE) environment, the total amount of rack space should not exceed 42 RUs. If your total configuration exceeds 42 RUs, either replan your configuration or use more than one rack to house the Cisco MGX 8950 switch components.

The location of the Cisco MGX switch and the layout of your rack or wiring room are extremely important for proper system operation. If equipment items are too close together, ventilation might be inadequate, and panels might become inaccessible. As a result, the system might malfunction or even shut down, and maintenance and repair are made more difficult.

A Cisco MGX switch requires access space around the cabinet. The suggested clearance at the front and the back of the cabinet is 30 inches (76.20 cm). The suggested clearance on each side of the cabinet is 12 inches (30.48 cm).

Note A vertical gap of 0.047 to 0.077 inch (0.119 to 0.196 cm) or about 1/16 inch must exist between adjacent modules to allow for module removal.

Position the switch should so that it does not interfere with the routing of cables and the termination of telephone or carrier circuits. Raised flooring is recommended so that there is enough space under the flooring for cables and wiring.

When planning your site layout and equipment locations, keep in mind the precautions that are described in the "Safety Requirements" section on page 3-2 and the "Site Requirements for the MGX 8950 Switch" section on page 3-28. These precautions can help you to avoid equipment failures and can reduce the possibility of environmentally caused shutdowns. If you are currently experiencing shutdowns or unusually high error rates with your existing equipment, these precautions might help you isolate the cause of failures and prevent future problems.

Temperature, Altitude, and Humidity

The system can tolerate a wide range of temperatures. Table 3-11 provides the Cisco recommendations for temperature, altitude, and humidity conditions in a CO and PE environment.

Table 3-11 CO and PE Operating Environment Requirements

Environmental Specification	Description
Temperature	32 to 104ºF (0 to 40ºC)—Normal operation 68 to 86ºF (20 to 30ºC)—Recommended operation[1]

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Table 3-11 CO and PE Operating Environment Requirements (continued)

Environmental Specification	Description
Altitude	up to 10,000 feet (up to 3048 meters)
Humidity	10 to 80% (noncondensing) at 50ºC

1. The switch can run up to 122ºF (50ºC) for up to 72 hours.

An AC-powered MGX 8950 switch dissipates up to 14,300 Btus (4200 W), and a DC-powered MGX 8950 switch dissipates up to 12,300 Btus (3600 W).

Warning **To prevent the system from overheating, do not operate it in an area that exceeds the maximum recommended ambient temperature of 104°F (40°C).** Statement 1047

Note Electrical equipment generates heat. Ambient air temperature might not be able to cool equipment to acceptable operating temperatures without adequate circulation. Ensure that the room in which you operate your system has adequate air circulation.

Enclosed racks must have adequate ventilation. Ensure that the rack is not overly congested, because each unit generates heat. An enclosed rack should have louvered sides and a fan to provide cooling air.

The enclosure must also provide adequate cooling through the use of an appropriately sized heat exchanger or air conditioner, which dissipates the heat generated by existing remote terminal system components and by the installed MGX 8950 switch.

Ventilation

The following practices ensure proper ventilation for the MGX 8950 switch:

- Install two fan trays within the switch: an upper and a lower fan tray
- Install an air intake plenum and an exhaust plenum within the switch

The main air intake vents are located in the air intake plenum component, which is installed under the switch. The air intake vent for the AC power supply tray is located on the front of the power supply tray panel.

All air exhaust vents are located at the rear of the exhaust plenum component. Ensure that the intake and exhaust vents are not obstructed in any way. Figure 3-7 shows the air flow through the MGX 8950 switch.

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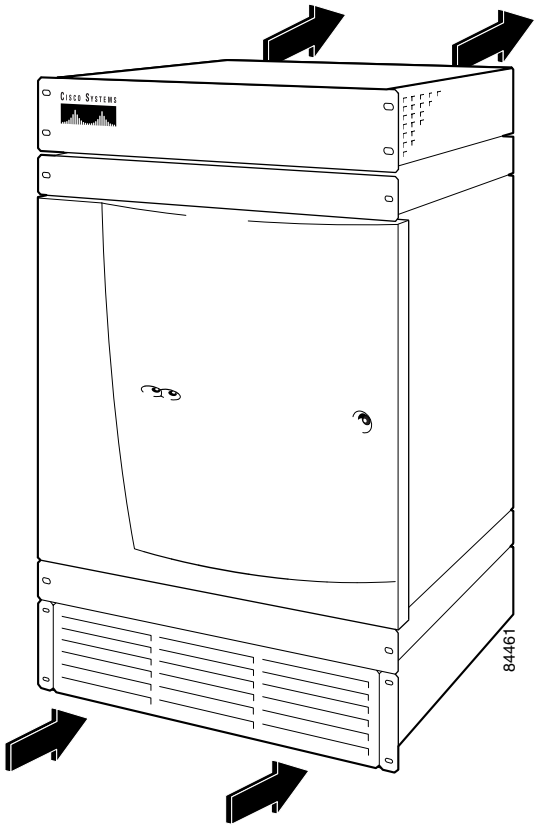
Figure 3-7 Air Flow Through Intake and Exhaust Vents for the MGX 8950 Switch



Note Electrical equipment generates heat. Ambient air temperature might not be able to cool equipment to acceptable operating temperatures without adequate circulation. Ensure that the room in which you operate your system has adequate air circulation.

Enclosed racks must have adequate ventilation. Ensure that the rack is not overly congested, because each unit generates heat. An enclosed rack should have louvered sides and a fan to provide cooling air.

The enclosure must also provide adequate cooling through the use of an appropriately sized heat exchanger or air conditioner, which dissipates the heat generated by existing remote terminal system components and by the installed MGX 8950 switch.

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Power Requirements

The system can accept power from either an optional AC source (AC power supply tray) or a DC source (DC PEM). Table 3-12 details the power specifications for both the AC and DC sources.

Table 3-12 Power Specifications for the MGX 8950 System

Specification	Description
Power input voltage	• AC source: Normal operating range is 200 to 240 VAC, 47 to 63 Hz. The maximum voltage range is 180 to 254 VAC. **Note** The AC power source must be within 6 feet (1.8 meters) of the system and easily accessible. • DC source: –42 to –56 VDC.
AC system current requirements	Configuration-dependent: Use Table 3-6 for exact requirements. For general planning purposes: 14.4 A at a nominal voltage of 200 VAC. At the minimum voltage limit of 180 VAC, the current draw is a maximum of 21 A.
DC system current requirements	Configuration-dependent: Use Table 3-6 for exact requirements. For general planning purposes: 76 A (37.5 A per feed) at nominal -48 VDC; 86 A (43 A per feed) at -42 VDC minimum.
Input AC power connector	For a list of the AC power plugs for domestic and international use, see Table 3-14 on page 3-39.
DC input connections	Three-position terminal block for 6 AWG wire (10 square millimeters), and no. 10 screw lugs designed for 6 AWG wire. The customer supplied wire must be terminated with a terminal lug that accepts no. 10-32 screws.

Warning **This unit is intended for installation in restricted access areas. A restricted access area is where access can only be gained by service personnel through the use of a special tool, lock and key, or other means of security, and is controlled by the authority responsible for the location.** Statement 37

Note In the United States, restricted access is defined in Articles 10-116, 10-117, and 10-118 of the National Electrical Code ANSI/NFPA 70.

The following sections provide additional information about power:

- AC Power, page 3-36
- DC Power, page 3-37
- Power Consumption Calculation Tables, page 3-37

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AC Power

AC power is supplied to the MGX 8950 switch through the AC power supply tray. AC power sources must be dedicated AC branch circuits. Each branch circuit must be protected by a dedicated two-pole circuit breaker.

The circuit breakers at the source must have a rated trip delay time greater than those of the MGX 8950 switch circuit breaker with a medium trip delay. The MGX 8950 switch uses a 30 A, 2-pole circuit breaker for each AC input. It is recommended that the site have a 30 A, 2-pole AC circuit breaker with a long trip delay at each branch circuit.

Note For more information about the AC power supply tray, see the "AC Power Supply Tray" section on page 1-25.

Tip Check the power at your site to ensure that you are receiving "clean" power (free of spikes and noise). Install a power conditioner if necessary.

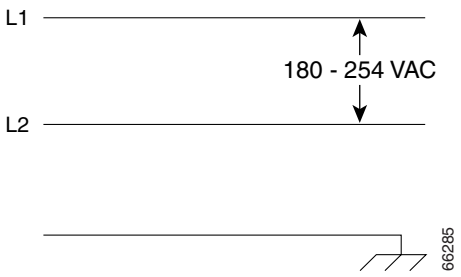
Caution Consult Cisco Customer Service if the plans for the system's AC power include an uninterruptible power source (UPS). It is recommended that you use a UPS with a low output impedance and the capacity to provide the necessary fault current to trip the protection devices. If the UPS cannot provide the fault current, the UPS must be equipped with a fault bypass switch that can trip the protection devices through the utility power. Do not use a UPS or any power source with a Ferro-Resonant transformer.

Caution For mission-critical applications, it is recommended that you use the dual AC power input tray with dual AC power cords, so that there can be no single or primary power failure.

The power receptacles to which the switch connects must be of the grounding type. The grounding conductors that connect to the receptacles should connect to protective earth at the service equipment. Figure 3-8 shows the hookup schematic in the three-wire wall plug.

For AC power cord details (part numbers and countries), see Table 3-14 on page 3-39.

Figure 3-8 Schematic of AC Plug Wiring



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DC Power

DC power is supplied to the MGX 8950 switch through one or two DC PEMs. Each DC PEM must be connected to a dedicated 100 A regulated source.

Each branch circuit must have a 100 A circuit breaker at the source. Wires connecting the PEMs to the sources should be capable of carrying 100 A. A 6-AWG (10-square mm) copper wire is recommended. Consult the local or national codes for conductor sizing for DC supply connections if necessary.

Note For more information about the DC PEM, see the "DC Power Entry Module" section on page 1-30.

DC power sources must be dedicated DC branch circuits. Each branch circuit must be protected by a dedicated circuit breaker. The circuit breaker must have a rated trip delay time greater than that of the Cisco MGX 8950 switch circuit breaker.

The MGX 8950 switch uses a 100 A, 1-pole circuit breaker with a short trip delay on each –48 V input. It is recommended that the site have a dedicated 100 A, 1-pole circuit breaker with a medium trip delay at each branch circuit.

Connect the safety grounding wire to a solid earth ground. It is recommended that you use a ring terminal lug to terminate the ground conductor at the ground stud. For details, see the "Bonding and Grounding the Cisco MGX System" section on page C-8.

Caution The –48 VDC return, logical grounds, and safety grounds are connected to the equipment chassis; therefore, you must use a low-impedance connector to connect the chassis ground to the earthing ground.

Note Connect the MGX 8950 switch only to a –48 VDC source that complies with the SELV requirements in UL 1950, IEC 950, EN 60950, and CSA C22.2 No. 950-95.

Power Consumption Calculation Tables

You can use Table 3-13 to calculate the typical power requirement for a MGX 8950 switch.

Table 3-13 Power Consumption Calculation for MGX 8950 Switch Components

Front Card	A Number of Cards Installed	B Watts Per Card	C Total Card Power (AxB)	D Total 48V Current (ADC) (C/48)
AXSM-1-2488/B		85.8		
• SMFLR-1-2488/B		19.4		
• SMFSR-1-2488/B		19.4		
• SMFXLR-1-2488/B		19.4		
AXSM-1-9953-XG		186		
• SMFIR-1-9953		24		
• SMFLR-1-9953		24		
• SMFSR-1-9953		24		

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Table 3-13 Power Consumption Calculation for MGX 8950 Switch Components (continued)

Front Card	A Number of Cards Installed	B Watts Per Card	C Total Card Power (AxB)	D Total 48V Current (ADC) (C/48)
• SMFXLR-1-9953		24		
AXSM-4-622/B		94.6		
• SMFIR-2-622/B		12		
• SMFLR-2-622/B		12		
AXSM-4-2488-XG		186		
• SMF-4-2488-SFP		24		
AXSM-16-155/B		94.6		
• MMF-8-155-MT/B		21.3		
• SMB-4-155		25		
• SMFIR-8-155-LC/B		12		
• SMFLR-8-155-LC/B		12		
AXSM-16-155-XG		185		
• MCC-8-155		19.8		
• SFP-8-155		13.3		
AXSM-16-T3E3/B		94.6		
• SMB-8-E3		10		
• SMB-8-T3		10		
PXM45/B		101		
• PXM-UI-S3		4		
• PXM-HD		9		
PXM45/C		121		
• PXM-UI-S3/B		4		
• PXM-HD		9		
RPM-PR-256		44		
• MMF-FE		3.03		
• RJ45-4E/B		1.25		
• RJ45-FE		3.03		
RPM-PR-512		45		
• MMF-FE		3.03		
• RJ45-4E/B		1.25		
• RJ45-FE		3.03		
RPM-XF-512		85		
• MGX-XF-UI		3		
• MGX-1OC12POS-IR		13		

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Table 3-13 Power Consumption Calculation for MGX 8950 Switch Components (continued)

Front Card	A Number of Cards Installed	B Watts Per Card	C Total Card Power (AxB)	D Total 48V Current (ADC) (C/48)
• MGX-1GE		11		
• MGX-2OC12POS-IR		15		
• MGX-2GE		13		
XM60		55.3		
Fan tray (for each) **Note** Two fan trays are needed at all times for the MGX 8950.		75.6		
DC PEM		20		
Totals				

Required Tools and Equipment

Table 3-14 lists the tools and equipment that you need to install and remove MGX 8950 switch components.

Note For additional cabling requirements, see Appendix B, "Cable Specifications."

Table 3-14 MGX 8950 Required Tools and Equipment

Check	Tools and Equipment
	Hardware Components and Cables
	MGX 8950 switch, with the front cards and back cards already installed
	If your configuration was not installed in a Cisco-supplied cabinet, you will need the following components for your system: • Cabinet or rack that meets the RETMA Standard EIA-310-D requirements • Upper and lower fan trays • Air intake plenum • Exhaust plenum • AC power supply tray with power supplies—for AC-powered systems • DC PEM—for DC-powered systems

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Table 3-14 MGX 8950 Required Tools and Equipment (continued)

Check	Tools and Equipment
	Front card blank faceplates, as needed: • Single-height service module: Cisco Part Number SINGLE SM-CVR • Double-height service module: Cisco Part Number DOUBLE SM-CVR • PXM45/B or PXM45/C: Cisco Part Number PROCESSOR CVR Back card blank faceplates, as needed: • For single-height cards: 800-215911-00. This is used on the MGX-8950-AC-R and MGX -8950-DC-R. **Warning** **Blank faceplates and cover panels serve three important functions: they prevent exposure to hazardous voltages and currents inside the chassis; they contain electromagnetic interference (EMI) that might disrupt other equipment; and they direct the flow of cooling air through the chassis. Do not operate the system unless all cards, faceplates, front covers, and rear covers are in place. Statement 1029**
	Mounting kit option for 23-inch rack: Cisco Part Number MGX-MNT23-8950
	Cable management assembly: Cisco Part Number MGX8950-CAB-MGMT
	Switch earthing conductor—Minimum of 6 AWG stranded copper wire, rated at minimum 90°C
	APS connector, as necessary—Cisco Part Number MGX-APS-CON-8950
	Fan tray power cable
	DC PEM power cable—For DC-powered systems
	AC power supply tray power cable—For AC-powered systems
	AC power cord for AC power supply tray, optional for AC power: • Europe: Cisco Part Number PWRCD-30A-EU • North America: Cisco Part Number PWRCD-30A-NA
	Wire for DC power connection—6 AWG (10 square mm) or larger three-wire solid or stranded copper wire with insulation rating for 140°F (60°C)
	Stability plate kit, optional—Cisco Part Number STRATM-STAB
	ESD protection equipment—Required whenever you handle Cisco equipment, which includes the switch, cards, and modules.
	Mounting screws—To mount the Cisco MGX 8950 switch, upper fan tray, lower fan tray, air intake plenum, exhaust plenum, and optional AC power supply tray in the rack
	Tools
	Small- and medium-sized flat-blade screwdrivers
	Small- and medium-sized Phillips screwdrivers

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Table 3-14 MGX 8950 Required Tools and Equipment (continued)

Check	Tools and Equipment
	3-in-1 tool (part 700-07569-01) with the following heads: • A flat head for unlatching front card ejectors and loosening and tightening the back card captive screws • A hex head for unlatching the chassis door • A Phillips head for loosening and tightening the back card captive screws
	Power screwdriver, optional
	Wire stripper
	Wire-wrapping tool, optional
	Fuse replacement tool (218090-00). **Warning** **This tool should only be used by trained personnel.**

Site Requirements for a MGX 8830 or MGX 8830/B Switch

This section describes requirements for the site where the MGX 8830 or MGX 8830/B switch is to be installed. Before you install the switch, ensure that all of the criteria in this section are met.

Table 3-15 summarizes the space, weight, and power requirements for the switch. Specifications are described in greater detail in the following sections:

- Environmental Requirements, page 3-42
- Power Requirements, page 3-47

Note One rack unit (RU) is equal to 1.75 inches (4.45 cm).

Caution The AC power source must be within 6 feet (1.8 meters) of the system and easily accessible.

Table 3-15 Space, Weight, and Power Specifications for a MGX 8830 or MGX 8830/B Switch

Specification		Description
Dimensions **Note** Racks must have at least 17.75 in. (45 cm) between mounting rails.	DC-powered system	7 RUs Height: 12.25 in. (31.12 cm) Width: 17.72 in. (45.01 cm) Depth: 23.5 in. (59.69 cm)—Excluding cable management and front door
	AC-powered system	8 RUs Height: 14.00 in. (35.56 cm) Width: 17.72 in. (45.01 cm) Depth: 23.5 in. (59.69 cm)—Excluding cable management and front door

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Table 3-15 Space, Weight, and Power Specifications for a MGX 8830 or MGX 8830/B Switch (continued)

Specification		Description
Weight	DC-powered switch AC-powered switch	A fully loaded, DC-powered system can weigh up to 120 lbs. (54.3 Kgs). A fully loaded AC-powered system can weigh up to 150 lbs. (68.03 Kgs).
Shipping weight for individual components		Front and back cards: 6.0 lb. (2.72 kg) per card set Card cage with cards: 120 lb. (54.3 kg) AC power supply tray with power supplies: 30 lb. (17.73 kg) APS connector: 1 lb (0.45 kg)
Clearance requirement for the enclosure		Minimum 30 in. front and rear; 12 in. side clearance recommended
Power input voltage		• AC source: Requires 220 VAC. Normal operating range is 200 to 240 VAC, 47 to 63 Hz. The maximum voltage range is 90 to 254 VAC. **Caution** The AC power source must be within 6 feet (1.8 meters) of the system and easily accessible. • DC source: –42 to –56 VDC.
AC system current requirements		Configuration-dependent: Use Table 3-19 for exact requirements. For general planning purposes: 14.4 A at a nominal voltage of 200 VAC. At the minimum voltage limit of 180 VAC, the current draw is a maximum of 16 A.
DC system current requirements		Configuration-dependent: Use Table 3-19 for exact requirements. For general planning purposes: 25 A at nominal –48 VDC; 29 A at –42 VDC maximum.

Environmental Requirements

Proper operation of the MGX 8830 switch depends on a proper environment. This section describes environmental requirements for the site where you intend to install the switch.

The following sections are included:

- Seismic Anchoring, page 3-43
- Shock, page 3-43
- Vibration, page 3-43
- Space, page 3-44
- Temperature, Altitude, and Humidity, page 3-46
- Ventilation, page 3-46

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Seismic Anchoring

In order for you to secure a Cisco-supplied cabinet, the holes in the upper and lower corners accommodate 3/8-inch or 1/2-inch bolts. Also, you can buy an optional stability plate with the Cisco cabinet. The stability plate is bolted to the floor, and then the Cisco cabinet is bolted to the stability plate. See Chapter 5, "Installing the Cisco MGX Switch or Gateway" for stability plate installation instructions.

Shock

For nonoperating mechanical shock and for equipment weighing more than 100 pounds, the peak acceleration will be between 20 to 25 G.

For operating mechanical shock, the minimum velocity change is 0.66 meters per second with an effective free fall drop height of 13 mm for Mechanical Design Validation Test (MDVT) and an effective free fall drop height of 25 mm for Network Equipment Building Standards (NEBS) with no velocity change specified.

Vibration

Table 3-16 describes the Cisco recommendations for vibration conditions.

Table 3-16 Vibration Condition Recommendations

Category	NEBS Description	MDVT Description
Earthquake	• No damage to the switch when tested to earthquake waveform. • 75-mm maximum single amplitude deflection. • Frame-level natural mechanical resonant frequency > 2 Hz. • Frame-level natural mechanical resonant frequency > 6 Hz. • Product must function before and after each axis. • Product must operate without loss of service during earthquake testing.	None
Office	• 3 axis swept-sine. • 5 Hz to 100 Hz to 5 Hz. • 0.1 G, 0.1 octaves/min.	• 0.41 Grms, 3 to 500 Hz • Spectral break points of 0.0005 G^1/Hz at 10 Hz and 200 Hz • 5 dB/octave roll-off at each end • 2 hrs per axis of operation

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Table 3-16 Vibration Condition Recommendations (continued)

Category	NEBS Description	MDVT Description
Transportation	• For rail, truck, ship, 5 to 100 Hz, 0.1 octave/min, 0.5 G. • For rail, truck, ship, jet, reciprocating or turbo prop aircraft, 100 to 500 Hz, 0.25 octave/min, 1.5 G.	• 3 to 300 Hz, 0.5 G[2] • 30 min per axis[2]
Non-Operational	None.	• 1.12 Grms, 3 to 500 Hz • Spectral break points of 0.0065 G[1]/Hz at 10 Hz and 100 Hz • 5 dB/octave roll-off at each end • 30 minutes in each of 3 axes

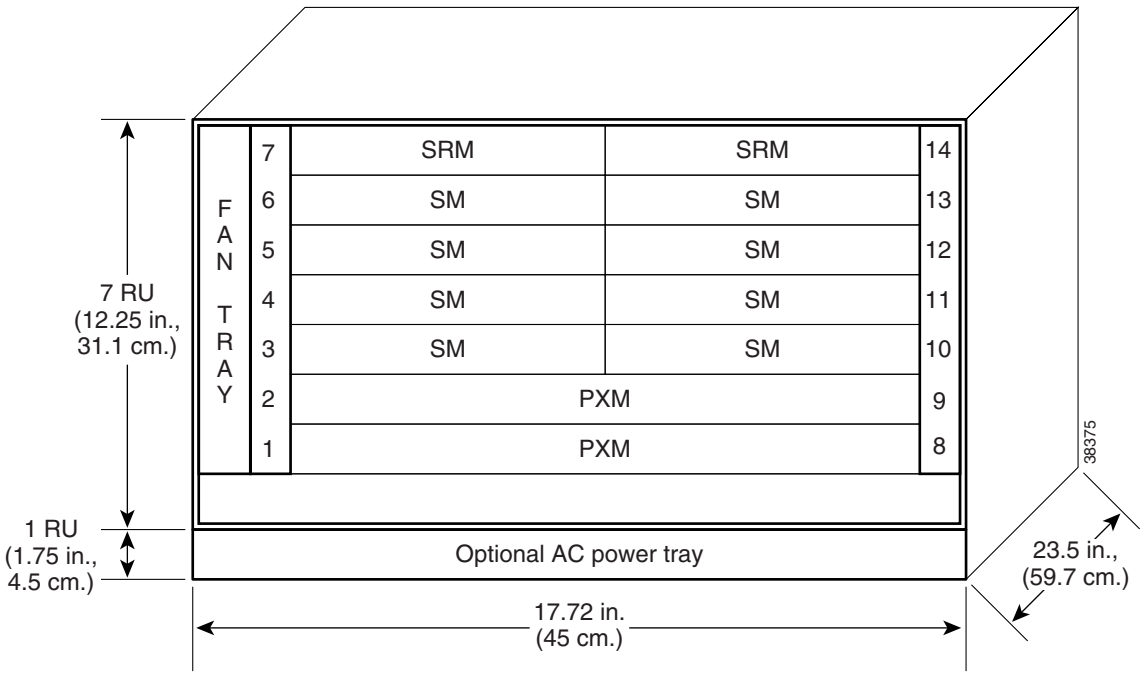
1. Office product—More than 2 m from regularly inhabited positions
2. Cisco package test specification

Space

You can install the following MGX 8830 or MGX 8830/B system components in a rack (as shown in Figure 3-9):

- MGX 8830 or MGX 8830/B switch
- AC power supply tray (optional)

Figure 3-9 Cisco MGX 8830 or MGX 8830/B Switch Components



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The MGX 8830 or MGX 8830/B switch and components fit in either a 19-inch (48.26 cm) wide rack or a 23-inch (58.42 cm) wide rack (with extenders installed). See Table 3-17 for component space requirements within the rack.

Table 3-17 MGX 8830 or MGX 8830/B Rack Space Requirements

Component	Rack Space	Height	Depth
MGX 8830 or MGX 8830/B switch	7 RUs	12.25 in. (31.12 cm)	23.5 in. (59.69 cm)
AC power supply tray (optional)	1 RU	1.75 in. (4.45 cm)	23.5 in. (59.69 cm)

Plan so that the rack accommodates your needs. An AC-powered MGX 8830 or MGX 8830/B switch occupies 14.00 inches (35.56 cm or 8 RUs) of vertical space. A DC-powered MGX 8830 or MGX 8830/B switch occupies 12.25 inches (31.12 cm or 7 RUs) of vertical space.

Note In a central office (CO) and private enterprise (PE) environment, the total amount of rack space should not exceed 42 RUs. If your total configuration exceeds 42 RUs, either replan your configuration or use more than one rack to house the switch components.

The location of the Cisco MGX switch and the layout of your rack or wiring room are extremely important for proper system operation. If equipment items are too close together, ventilation might be inadequate, and panels might become inaccessible. As a result, the system might malfunction or even shut down, and maintenance and repair are made more difficult.

A Cisco MGX switch requires access space around the cabinet. The suggested clearance at the front and the back of the cabinet is 30 inches (76.20 cm). The suggested clearance on each side of the cabinet is 12 inches (30.48 cm).

Note A vertical gap of 0.047 to 0.077 inch (0.119 to 0.196 cm) or about 1/16 inch must exist between adjacent modules to allow for module removal.

Position the switch so that it does not interfere with the routing of cables and the termination of telephone or carrier circuits. Raised flooring is recommended so that there is enough space under the flooring for cables and wiring.

When planning your site layout and equipment locations, keep in mind the precautions that are described in the "Safety Requirements" section on page 3-2 and the "Site Requirements for a MGX 8830 or MGX 8830/B Switch" section on page 3-41. These precautions can help you to avoid equipment failures and can reduce the possibility of environmentally caused shutdowns. If you are currently experiencing shutdowns or unusually high error rates with your existing equipment, these precautions might help you isolate the cause of failures and prevent future problems.

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Temperature, Altitude, and Humidity

The system can tolerate a wide range of temperatures. Table 3-18 describes the Cisco recommendations for temperature, altitude, and humidity conditions in a CO and PE environment.

Table 3-18 CO and PE Operating Environment Requirements

Environmental Specifications	Description
Temperature	32 to 104ºF (0 to 40ºC)—Normal operation 68 to 86ºF (20 to 30ºC)—Recommended operation[1]
Altitude	–197 to 13124 feet (–60 to 4000 meters)
Humidity	Up to 85% (noncondensing)

1. The switch can run up to 122ºF (50ºC) for up to 72 hours.

An AC-powered MGX 8830 or MGX 8830/B switch dissipates up to 4800 BTUs (1.4 kW) per hour, and a DC-powered MGX 8830 or MGX 8830/B switch dissipates up to 4100 BTUs (1.2 kW) per hour.

Warning **To prevent the system from overheating, do not operate it in an area that exceeds the maximum recommended ambient temperature of 104°F (40°C).** Statement 1047

Note Electrical equipment generates heat. Ambient air temperature might not be able to cool equipment to acceptable operating temperatures without adequate circulation. Ensure that the room in which you operate your system has adequate air circulation.

Enclosed racks must have adequate ventilation. Ensure that the rack is not overly congested, because each unit generates heat. An enclosed rack should have louvered sides and a fan to provide cooling air.

The enclosure must also provide adequate cooling through the use of an appropriately sized heat exchanger or air conditioner, which dissipates the heat generated by existing remote terminal system components and by the installed switch.

Ventilation

The fan tray, located inside the card cage, pulls ambient cooling air into the system through openings between the front card faceplates, over the boards in the switch, and out through the air exhaust openings on the left side of the switch.

The fan tray houses eight fans that provide system cooling. The MGX 8830 or MGX 8830/B switch requires that a fan tray be installed when the system is in operation.

Note There must be at least two inches of empty space around the front and rear panels of the AC power supply for cooling air.

Electrical equipment generates heat. Ambient air temperature might not be able to cool equipment to acceptable operating temperatures without adequate circulation. Ensure that the room in which you operate your system has adequate air circulation.

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Enclosed racks must have adequate ventilation. Ensure that the rack is not overly congested, because each unit generates heat. An enclosed rack should have louvered sides and a fan to provide cooling air.

The enclosure must also provide adequate cooling through the use of an appropriately sized heat exchanger or air conditioner, which dissipates the heat generated by existing remote terminal system components and by the installed MGX 8830 or MGX 8830/B switch.

Power Requirements

The system can accept power from either an optional AC source (AC power supply tray) or a DC source (DC PEM). Table 3-19 details the power specifications for both the AC and DC sources.

Table 3-19 Power Specifications for the MGX 8830 System

Specification	Description
Power input voltage	• AC source: Requires 220 VAC. Normal operating range is 200 to 240 VAC, 47 to 63 Hz. The maximum voltage range is 90 to 254 VAC. **Caution** The AC power source must be within 6 feet (1.8 meters) of the system and easily accessible. • DC source: –42 to –56 VDC.
AC system current requirements	Configuration-dependent: Use Table 3-20 for exact requirements. For general planning purposes: 7 A at a nominal voltage of 200 VAC. At 110 VAC, the current draw is a maximum of 13 A.
DC system current requirements	Configuration-dependent: Use Table 3-20 for exact requirements. For general planning purposes: 25 A at nominal –48 VDC; 29 A at –42 VDC maximum.
Input AC power connector	IEC 320-type C14 inlet. For a list of the AC power plugs for domestic and international use, see the "Required Tools and Equipment" section on page 3-53.
DC input connections	Three-position terminal block for 10 AWG wire (4 square millimeters).

Warning **This unit is intended for installation in restricted access areas. A restricted access area is where access can only be gained by service personnel through the use of a special tool, lock and key, or other means of security, and is controlled by the authority responsible for the location.** Statement 37

Note In the United States, restricted access is defined in Articles 10-116, 10-117, and 10-118 of the National Electrical Code ANSI/NFPA 70.

The following sections provide additional information about power:

- AC Power, page 3-48
- DC Power, page 3-48
- Power Consumption Calculation Tables, page 3-49

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AC Power

AC power sources must be dedicated AC branch circuits. Each branch circuit must be protected by a dedicated two-pole circuit breaker.

Tip Check the power at your site to ensure that you are receiving "clean" power (free of spikes and noise). Install a power conditioner if necessary.

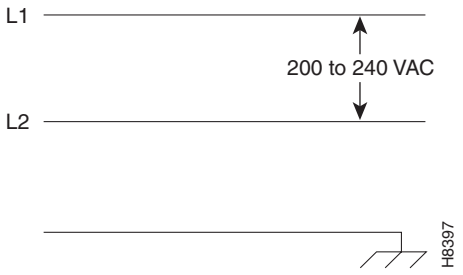
Caution Consult Cisco Customer Service if the plans for the system's AC power include an uninterruptible power source (UPS). It is recommended that you use a UPS with a low output impedance and the capacity to provide the necessary fault current to trip the protection devices. If the UPS cannot provide the fault current, the UPS must be equipped with a fault bypass switch that can trip the protection devices through the utility power. Do not use a UPS or any power source with a Ferro-Resonant transformer.

Caution For mission-critical applications, it is recommended that you use the dual AC power input tray with dual AC power cords, so that there can be no single or primary power failure.

The power receptacles to which the switch connects must be of the grounding type. The grounding conductors that connect to the receptacles should connect to protective earth at the service equipment. Figure 3-10 shows the hookup schematic in the three-wire wall plug. The figure is the same for 100 to 120 VAC.

For AC power cord details (part numbers and countries), see Table 3-21 on page 3-53.

Figure 3-10 Schematic of AC Plug Wiring



DC Power

DC power is supplied to the MGX 8830 or MGX 8830/B switch through one or two DC PEMs. Each DC PEM must be connected to a dedicated 30-A regulated source. Each branch circuit must have a 30-A circuit breaker at the source.

Wires connecting the PEMs to the sources should be capable of carrying 30 A. A 10AWG (4-square mm) copper wire is recommended. Consult the local or national codes for conductor sizing for DC supply connections if necessary.

Note For more information about the DC PEM, see the "DC Power Entry Module (PEM)" section on page 1-54.

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DC power sources must be dedicated DC branch circuits. Each branch circuit must be protected by a dedicated circuit breaker. The circuit breaker must have a rated trip delay time greater than that of the MGX 8830 or MGX 8830/B switch circuit breaker.

The MGX 8830 or MGX 8830/B switch uses a 30-A, 1-pole circuit breaker with a short trip delay on each –48 V input. It is recommended that the site have a dedicated 30-A, 1-pole circuit breaker with a medium trip delay at each branch circuit.

Connect the safety grounding wire to a solid earth ground. It is recommended that you use a ring terminal lug to terminate the ground conductor at the ground stud. For details, see the "Bonding and Grounding the Cisco MGX System" section on page C-8.

Caution The –48 VDC return, logical grounds, and safety grounds are connected to the equipment chassis; therefore, you must use a low-impedance connector to connect the chassis ground to the earthing ground.

Note Connect the MGX 8830 or MGX 8830/B switch only to a –48 VDC source that complies with the SELV requirements in UL 1950, IEC 950, EN 60950, and CSA C22.2 No. 950-95.

Power Consumption Calculation Tables

You can use Table 3-20 to calculate the typical power requirement for a MGX 8830 or MGX 8830/B switch.

Table 3-20 Power Consumption Calculation for Cisco MGX 8830 or MGX 8830/B Switch Components

Front Card	A Number of Cards Installed	B Watts Per Card	C Total Card Power (AxB)	D Total 48V Current (ADC) (C/48)
AUSM-8E1/B		28.22		
• MGX-RJ48-8E1		3		
• RJ48-8E1		3		
• R-RJ48-8E1		3		
• SMB-8E1		5		
• R-SMB-8E1		5		
AUSM-8T1/B		28.22		
• RJ48-8T1		3		
• R-RJ48-8T1		3		
CESM-8E1		29.1		
• MGX-RJ48-8E1		3		
• RJ48-8E1		3		
• R-RJ48-8E1		3		
• SMB-8E1		5		
• R-SMB-8E1		5		

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Table 3-20 Power Consumption Calculation for Cisco MGX 8830 or MGX 8830/B Switch Components (continued)

Front Card	A Number of Cards Installed	B Watts Per Card	C Total Card Power (AxB)	D Total 48V Current (ADC) (C/48)
CESM-8T1/B		29.1		
• RJ48-8T1		3		
• R-RJ48-8T1		3		
FRSM-2CT3		49		
• BNC-2T3		5		
FRSM-2T3E3		30		
• BNC-2E3 and BNC-2E3A		5		
• BNC-2T3		5		
FRSM-8E1		25.84		
• MGX-RJ48-8E1		3		
• RJ48-8E1		3		
• R-RJ48-8E1		3		
• SMB-8E1		5		
• R-SMB-8E1		5		
FRSM-8E1-C		25.84		
• MGX-RJ48-8E1		3		
• RJ48-8E1		3		
• R-RJ48-8E1		3		
• SMB-8E1		5		
• R-SMB-8E1		5		
FRSM-8T1		25.84		
• RJ48-8T1		3		
• R-RJ48-8T1		3		
FRSM-8T1-C		25.84		
• RJ48-8T1		3		
• R-RJ48-8T1		3		
FRSM-HS2/B		46.4		
• 12IN1-8S		2		
• SCSI2-2HSSI/B		15		
MPSM-8-T1E1		36.3		
• RJ48-8T1		3		
• R-RJ48-8T1		3		

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Table 3-20 Power Consumption Calculation for Cisco MGX 8830 or MGX 8830/B Switch Components (continued)

Front Card	A Number of Cards Installed	B Watts Per Card	C Total Card Power (AxB)	D Total 48V Current (ADC) (C/48)
• MGX-RJ48-8E1		3		
• RJ48-8E1		3		
MPSM-16T1E1		40		
• MCC-16-T1E1-1N		8		
• RBBN-16-T1E1-1N		8		
• RED-16-T1E1		8		
MPSM-T3E3-155		50		
• BNC-3-T3E3-Y		4		
• SFP-2-155-1		9		
• SMB-2-155-EL		10		
PXM1E-4-155		87		
• PXM-UI-S3 or PXM-UI-S3/B		4		
• MMF-4-155/C		21.3		
• SMFIR-4-155/C		12		
• SMFLR-4-155/C		12		
PXM1E-8-155		96		
• PXM-UI-S3/B		4		
• MCC-8-155		23		
• SFP-8-155		7		
PXM1E-8-T3E3		85.4		
• PXM-UI-S3 or PXM-UI-S3/B		4		
• SMB-8-T3		10		
• SMB-8-E3		10		
PXM1E-16-T1E1		87		
• PXM-UI-S3/B		3		
• MCC-16-E1		5		
• RBBN-16-T1E1		5		
PXM1E-T3E3-155		96		
• PXM-UI-S3 or PXM-UI-S3/B		4		
• T3E3-155		10		
RPM-PR-256		44		

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Table 3-20 Power Consumption Calculation for Cisco MGX 8830 or MGX 8830/B Switch Components (continued)

Front Card	A Number of Cards Installed	B Watts Per Card	C Total Card Power (AxB)	D Total 48V Current (ADC) (C/48)
• MMF-FE		3.03		
• RJ45-4E/B		1.25		
• RJ45-FE		3.03		
RPM-PR-512		45		
• MMF-FE		3.03		
• RJ45-4E/B		1.25		
• RJ45-FE		3.03		
SRM-3T3/C		25.24		
• BNC-3T3-M		4		
SRME		32		
• SMFIR-1-155		4.1		
• STM1-EL-1		6.3		
SRME/B		27.5		
• SMFIR-1-155		4.1		
• STM1-EL-1		6.3		
VISM-PR-8E1		60		
• MGX-RJ48-8E1		3		
• RJ48-8E1		3		
• R-RJ48-8E1		3		
• SMB-8E1		5		
• R-SMB-8E1		5		
VISM-PR-8T1		60		
• RJ48-8T1		3		
• R-RJ48-8T1		3		
Fan tray (for each)		67		
DC PEM		20		
Totals				

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Required Tools and Equipment

Table 3-21 lists the tools and equipment that you need to install and remove the MGX 8830 or MGX 8830/B switch components.

Note For additional cabling requirements, see Appendix B, "Cable Specifications."

Table 3-21 MGX 8830 or MGX 8830/B Required Tools and Equipment

Check	Tools and Equipment
	Hardware Components and Cables
	MGX 8830 or MGX 8830/B switch, with front cards, back cards, and fan tray installed
	If your configuration was not installed in a Cisco-supplied cabinet, you will need the following components for your system: • Cabinet or rack that meets the RETMA Standard EIA-310-D requirements • AC power supply tray with power supplies—for AC-powered systems. Cisco Part Number MGX-8830-PS-AC. The redundant AC power supply is Cisco Part Number MGX-8830-PS-AC-R. • DC PEM—for DC-powered systems. Cisco Part Number MGX-8830-PEM. The redundant PEM is Cisco Part Number MGX-8830-PEM-R.
	Blank faceplates, as necessary; • Single-height service module: Cisco Part Number SINGLE SM-CVR • SRM: Cisco Part Number SRM-CVR • Double-height service module: Cisco Part Number DOUBLE SM-CVR • PXM1E: Cisco Part Number PROCESSOR CVR Back card blank faceplates, as needed: • For single-height back cards: 800-215911-00. **Warning** **Blank faceplates and cover panels serve three important functions: they prevent exposure to hazardous voltages and currents inside the chassis; they contain electromagnetic interference (EMI) that might disrupt other equipment; and they direct the flow of cooling air through the chassis. Do not operate the system unless all cards, faceplates, front covers, and rear covers are in place. Statement 1029**
	Mounting kit option for 23-inch rack: Cisco Part Number MGX-8830-MNT23 or Mounting kit option for 19-inch rack: Cisco Part Number MGX-8830-MNT19
	Cable management assembly: Cisco Part Number MGX-CAB-MGMT
	Switch earthing conductor—Minimum of 6 AWG stranded copper wire, rated at minimum 90°C
	APS connector, as necessary—Cisco Part Number MGX-8830-APS-CON
	RCON, as necessary—Cisco Part Number RCON-1TO3-8830 (8830/B only)
	Fan tray power cable

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Table 3-21 MGX 8830 or MGX 8830/B Required Tools and Equipment (continued)

Check	Tools and Equipment
	AC power supply tray power cable—For AC-powered systems
	AC power cord for AC power supply tray, optional for AC power: • Argentina: Cisco Part Number CAB-ACR • Australia: Cisco Part Number CAB-ACA • Continental Europe: Cisco Part Number CAB-ACE • Great Britain: Cisco Part Number CAB-ACU • Ireland: Cisco Part Number CAB-ACU • Italy: Cisco Part Number CAB-ACI • New Zealand: Cisco Part Number CAB-ACA • North America: Cisco Part Number CAB-AC-125V/13A (125 VAC, 13 A) or CAB-AC-250V/13A (250 VAC, 13 A) • Switzerland: Cisco Part Number CAB-ACS
	Wire for DC power connection—10 AWG (4 square mm) or larger three-wire solid or stranded copper wire with insulation rating for 140°F (60°C)
	Stability plate kit, optional—Cisco Part Number STRATM-STAB
	ESD protection equipment—Required whenever you handle Cisco equipment, which includes the switch, cards, and modules
	Mounting screws—To mount the Cisco MGX 8830 switch and optional AC power supply tray in the rack
	Tools
	Small- and medium-sized flat-blade screwdrivers
	Small- and medium-sized Phillips screwdrivers
	3-in-1 tool (part 700-07569-01) with the following heads: • A flat head for unlatching front card ejectors and loosening and tightening the back card captive screws • A hex head for unlatching the chassis door • A Phillips head for loosening and tightening the back card captive screws
	Power screwdriver, optional
	Wire stripper
	Wire-wrapping tool, optional
	Fuse replacement tool (218090-00). **Warning** **This tool should only be used by trained personnel.**

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Site Requirements for the MGX 8880 Media Gateway

This section describes requirements for the site where the MGX 8880 Media Gateway is to be installed. Before you install the switch, ensure that all of the criteria in this section are met.

Table 3-22 summarizes the space, weight, and power requirements for the gateway. Specifications are described in greater detail in the following sections:

- Environmental Requirements, page 3-56
- Power Requirements, page 3-62

Note One rack unit (RU) is equal to 1.75 inches (4.45 cm).

Table 3-22 Space, Weight, and Power Specifications for the MGX 8880 Media Gateway

Specification		Description
Dimensions **Note** Racks must have 17.75 in. minimum between mounting rails.	DC-powered system	14 RUs Height: 24.5 in. (62.23 cm) Width: 19 in. (48.26 cm) Depth: 21.5 in. (54.6 cm)—Excluding cable management and front door
	AC-powered system	17 RUs Height: 29.75 in. (75.57 cm) Width: 19 in. (48.26 cm) Depth: 21.5 in. (54.61 cm)—Excluding cable management and front door
Weight	DC-powered switch	Up to 190 lb. (86.26 kg)
	AC-powered switch	Up to 250 lb. (113.5 kg)
Shipping weight for individual components		VXSM-4-155, VXSM-48T1E, and VXSM-6-T3 front cards: 7.5 lb. each (3.4 kg) VXSM-BC-4-155, VXSM-BC-24T1E1, VXSM-BC-3-T3, and VXSM-R-BC back cards: 1 lb. each (.45 kg) Card cage with cards: 160 lb. (72.64 kg) Exhaust plenum: 8 lb (3.63 kg) Fan tray: 9.5 lb (4.3 kg) Air intake plenum: 8 lb (3.63 kg) AC power supply tray with power supplies: 45 lb. (20.43 kg) APS connector: 1 lb (0.45 kg)
Clearance requirement for the enclosure		Minimum 30 in. front and rear; 12 in. side clearance recommended

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Table 3-22 Space, Weight, and Power Specifications for the MGX 8880 Media Gateway (continued)

Specification	Description
Power input voltage	• AC source: Requires 220 VAC. Normal operating range is 200 to 240 VAC, 47 to 63 Hz. The maximum voltage range is 180 to 254 VAC. **Note** The AC power source must be within 6 feet (1.8 meters) of the system and easily accessible. • DC source: –42 to –56 VDC.
AC system current requirements	Configuration-dependent: Use Table 3-27 for exact requirements. For general planning purposes: 14.4 A at a nominal voltage of 200 VAC. At the minimum voltage limit of 180 VAC, the current draw is a maximum of 16 A.
DC system current requirements	Configuration-dependent: Use Table 3-27 for exact requirements. For general planning purposes: 50 A at nominal –48 VDC; 57.1 A at –42 VDC maximum.

Environmental Requirements

Proper operation of the MGX 8880 Media Gateway depends on a proper environment. This section describes environmental requirements for the site where you intend to install the media gateway.

The following sections are included:

- Seismic Anchoring, page 3-56
- Shock, page 3-56
- Vibration, page 3-57
- Space, page 3-57
- Temperature, Altitude, and Humidity, page 3-60
- Ventilation, page 3-60

Seismic Anchoring

In order for you to secure a Cisco-supplied cabinet, the holes in the upper and lower corners accommodate 3/8-inch or 1/2-inch bolts. Also, you can buy an optional stability plate with the Cisco cabinet. The stability plate is bolted to the floor, and then the Cisco cabinet is bolted to the stability plate. See Chapter 5, "Installing the Cisco MGX Switch or Gateway" for stability plate installation instructions.

Shock

For nonoperating mechanical shock and for equipment weighing more than 100 pounds, the peak acceleration will be from 20 to 25 G.

For operating mechanical shock, the minimum velocity change is 0.66 meters per second with an effective free fall drop height of 13 mm for Mechanical Design Validation Test (MDVT) and an effective free fall drop height of 25 mm for Network Equipment Building Standards (NEBS) with no velocity change specified.

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Vibration

Table 3-23 describes the Cisco recommendations for vibration conditions.

Table 3-23 Vibration Condition Recommendations

Category	NEBS Description	MDVT Description
Earthquake	• No damage to the switch when tested to earthquake waveform. • 75-mm maximum single amplitude deflection. • Frame-level natural mechanical resonant frequency > 2 Hz. • Frame-level natural mechanical resonant frequency > 6 Hz. • Product must function before and after vibration is applied to each axis (x = side to side, y = front to back, z = up and down). • Product must operate without loss of service during earthquake testing.	• None
Office	• 3 axis swept-sine. • 5 Hz to 100 Hz to 5 Hz. • 0.1 G, 0.1 octaves/min.	• 0.41 Grms, 3 to 500 Hz • Spectral break points of 0.0005 G^1/Hz at 10 Hz and 200 Hz • 5 dB/octave roll-off at each end • 2 hrs per axis of operation
Transportation	• For rail, truck, ship, 5 to 100 Hz, 0.1 octave/min, 0.5 G. • For rail, truck, ship, jet, reciprocating or turbo prop aircraft, 100 to 500 Hz, 0.25 octave/min, 1.5 G.	• 3 to 300 Hz, 0.5 G^2 • 30 min per axis[2]
Non-Operational	• None.	• 1.12 Grms, 3 to 500 Hz • Spectral break points of 0.0065 G^1/Hz at 10 Hz and 100 Hz • 5 dB/octave roll-off at each end • 30 minutes in each of 3 axes

1. Office product—More than 2 m from regularly inhabited positions
2. Cisco package test specification

Space

You can install the following MGX 8880 Media Gateway components in a rack (as shown in Figure 3-11):

- Exhaust plenum
- Upper fan tray
- MGX 8880 Media Gateway
- Lower fan tray

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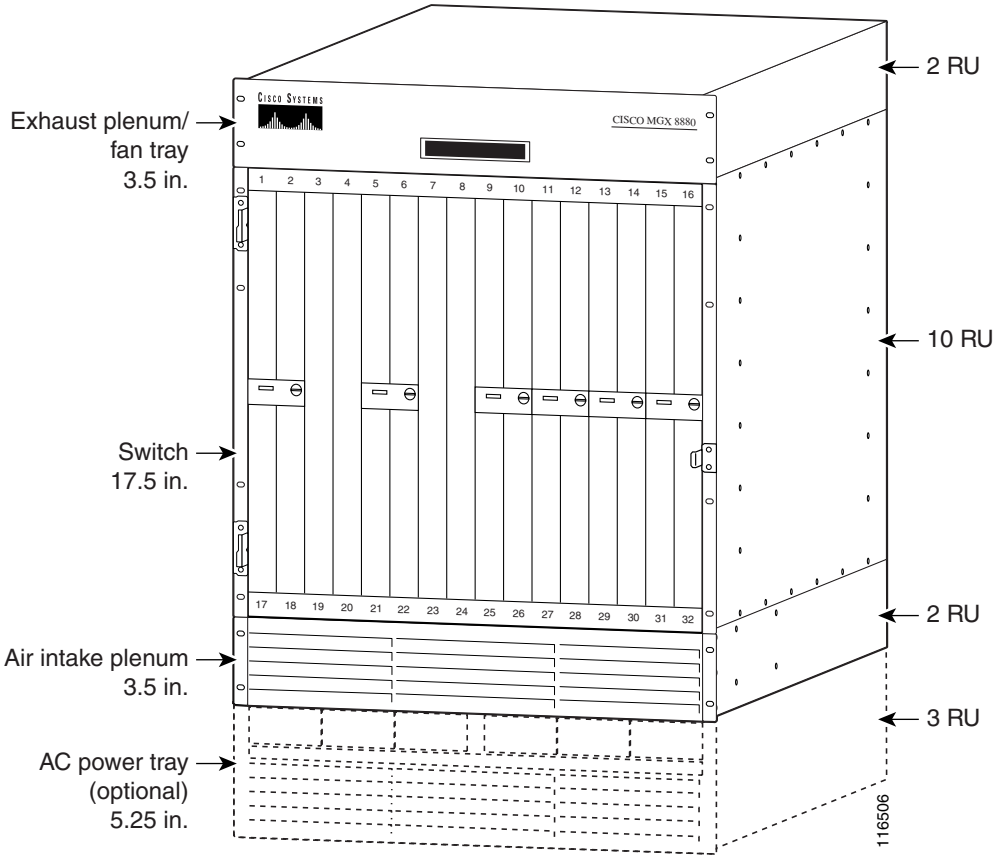
- Air intake plenum
- AC power supply tray (optional)

Figure 3-11 MGX 8880 Media Gateway Components



The MGX 8880 Media Gateway and components fit in either a 19-inch (48.26 cm) wide rack or a 23-inch (58.42 cm) wide rack (with extenders installed).

Plan so that the rack accommodates your needs:

- The DC Media Gateway is 14 RUs (24.5 in. or 62.23 cm), and three gateways can fit in a seven-foot rack (see Table 3-24).
- The Media Gateway with the optional AC power tray is 17 RUs (29.75 in. or 75.57 cm) as described in Table 3-25.

Table 3-24 MGX 8880 (14 RU) Rack Space Requirements ("Three in a Rack")

Component	Rack Space	Height	Depth
Exhaust plenum with fan tray	2 RUs	3.50 in. (8.89 cm)	21.5 in. (54.61 cm)
MGX 8880 Media Gateway	10 RUs	17.5 in. (44.45 cm)	21.5 in. (54.61 cm)
Air intake plenum with DC power supply	2 RUs	3.50 in. (8.89 cm)	21.5 in. (54.61 cm)

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Table 3-25 MGX 8880 (17 RU) Rack Space Requirements (with Optional AC Power Tray)

Component	Rack Space	Height	Depth
Exhaust plenum with fan tray	2 RUs	3.50 in. (8.89 cm)	21.5 in. (54.61 cm)
MGX 8880 Media Gateway	10 RUs	17.5 in. (44.45 cm)	21.5 in. (54.61 cm)
Air intake plenum with DC power supply	2 RUs	3.50 in. (8.89 cm)	21.5 in. (54.61 cm)
AC power supply tray (optional)	3 RUs	5.25 in. (13.34 cm)	21.5 in. (54.61 cm)

Note In a central office (CO) and private enterprise (PE) environment, the total amount of rack space should not exceed 42 RUs. If your total configuration exceeds 42 RUs, either replan your configuration or use more than one rack to house the MGX 8880 Media Gateway components.

The location of the MGX media gateway and the layout of your rack or wiring room are extremely important for proper system operation. If equipment items are too close together, ventilation might be inadequate, and panels might become inaccessible. As a result, the system might malfunction or even shut down, and maintenance and repair are made more difficult.

A MGX media gateway requires access space around the cabinet. The suggested clearance at the front and the back of the cabinet is 30 inches (76.20 cm). The suggested clearance on each side of the cabinet is 12 inches (30.48 cm).

Note A vertical gap of 0.047 to 0.077 inch (0.119 to 0.196 cm) or about 1/16 inch must exist between adjacent modules to allow for module removal.

Position the switch so that it does not interfere with the routing of cables and the termination of telephone or carrier circuits. Raised flooring is recommended so that there is enough space under the flooring for cables and wiring.

When planning your site layout and equipment locations, keep in mind the precautions that are described in the "Safety Requirements" section on page 3-2 and the "Site Requirements for the MGX 8880 Media Gateway" section on page 3-55. These precautions can help you to avoid equipment failures and can reduce the possibility of environmentally caused shutdowns. If you are currently experiencing shutdowns or unusually high error rates with your existing equipment, these precautions might help you isolate the cause of failures and prevent future problems.

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Temperature, Altitude, and Humidity

The system can tolerate a wide range of temperatures. Table 3-26 provides the Cisco recommendations for temperature, altitude, and humidity conditions in a CO and PE environment.

Table 3-26 CO and PE Operating Environment Requirements

Environmental Specification	Description
Temperature	32 to 104ºF (0 to 40ºC)—Normal operation 68 to 86ºF (20 to 30ºC)—Recommended operation[1]
Altitude	–197 to 13124 feet (–60 to 4000 meters)
Humidity	Up to 85% (noncondensing)

1. The switch can run up to 122ºF (50ºC) for up to 72 hours.

An AC-powered MGX 8880 Media Gateway dissipates up to 9560 BTUs (2.8 kW) per hour, and a DC-powered MGX 8880 Media Gateway dissipates up to 8200 BTUs (2.4 kW) per hour.

Warning **To prevent the system from overheating, do not operate it in an area that exceeds the maximum recommended ambient temperature of 104°F (40°C).** Statement 1047

Note Electrical equipment generates heat. Ambient air temperature might not be able to cool equipment to acceptable operating temperatures without adequate circulation. Ensure that the room in which you operate your system has adequate air circulation.

Enclosed racks must have adequate ventilation. Ensure that the rack is not overly congested, because each unit generates heat. An enclosed rack should have louvered sides and a fan to provide cooling air.

The enclosure must also provide adequate cooling through the use of an appropriately sized heat exchanger or air conditioner, which dissipates the heat generated by existing remote terminal system components and by the installed MGX 8880 Media Gateway.

Ventilation

The main air intake vents are located in the air intake plenum component, which is installed under the switch. The air intake vent for the AC power supply tray is located on the front of the power supply tray panel.

All air exhaust vents are located at the rear and sides of the exhaust plenum component. Ensure that the intake and exhaust vents are not obstructed in any way. Figure 3-12 shows the air flow through the MGX 8880 Media Gateway.

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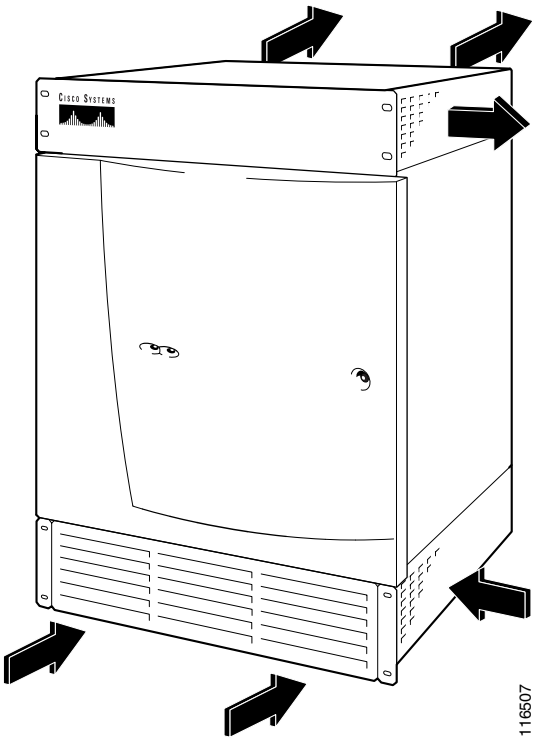
Figure 3-12 Air Flow Through Intake and Exhaust Vents for the Cisco MGX 8880 Media Gateway



Note Electrical equipment generates heat. Ambient air temperature might not be able to cool equipment to acceptable operating temperatures without adequate circulation. Ensure that the room in which you operate your system has adequate air circulation.

Enclosed racks must have adequate ventilation. Ensure that the rack is not overly congested, because each unit generates heat. An enclosed rack should have louvered sides and a fan to provide cooling air.

The enclosure must also provide adequate cooling through the use of an appropriately sized heat exchanger or air conditioner, which dissipates the heat generated by existing remote terminal system components and by the installed MGX 8880 Media Gateway.

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Power Requirements

The system can accept power from either an optional AC source (AC power supply tray) or a DC source (DC PEM). Table 3-27 details the power specifications for both the AC and DC sources.

Table 3-27 Power Specifications for the MGX 8880 Media Gateway

Specification	Description
Power input voltage	• AC source: Requires 220 VAC. Normal operating range is 200 to 240 VAC, 47 to 63 Hz. The maximum voltage range is 180 to 254 VAC. **Note** The AC power source must be within 6 feet (1.8 meters) of the system and easily accessible. • DC source: –42 to –56 VDC.
AC system current requirements	Configuration-dependent: Use Table 3-20 for exact requirements. For general planning purposes: 14.4 A at a nominal voltage of 200 VAC. At the minimum voltage limit of 180 VAC, the current draw is a maximum of 16 A.
DC system current requirements	Configuration-dependent: Use Table 3-20 for exact requirements. For general planning purposes: 50 A at nominal –48 VDC; 57.1 A at –42 VDC maximum.
Input AC power connector	IEC 320-type C19 (20 A North American, 16 A International) input connector. For a list of the AC power plugs for domestic and international use, see the Table 3-29 on page 3-67.
DC input connections	Three-position terminal block for 6 AWG wire (10 square millimeters), no. 10 screw lugs designed for 6 AWG wire and Panduit (part number LC AS6-10-L). The customer-supplied wire must be terminated with a terminal lug that accepts no. 10-32 screws.

Warning **This unit is intended for installation in restricted access areas. A restricted access area is where access can only be gained by service personnel through the use of a special tool, lock and key, or other means of security, and is controlled by the authority responsible for the location.** Statement 37

Note In the United States, restricted access is defined in Articles 10-116, 10-117, and 10-118 of the National Electrical Code ANSI/NFPA 70.

The following sections provide additional information about power:

- AC Power, page 3-63
- DC Power, page 3-64
- Power Consumption Calculation Tables, page 3-64

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AC Power

AC power is supplied to the MGX 8880 Media Gateway through the AC power supply tray. AC power sources must be dedicated AC branch circuits.

Each branch circuit must be protected by a dedicated two-pole circuit breaker. The circuit breakers at the source must have a rated trip delay time greater than those of the MGX 8880 Media Gateway circuit breaker with a medium trip delay.

The MGX 8880 Media Gateway uses a 20-A, 2-pole circuit breaker for each AC input. It is recommended that the site have a 20-A, 2-pole AC circuit breaker with a long trip delay at each branch circuit.

Note For more information about the AC power supply tray, see the "AC Power Supply Tray" section on page 1-25.

Tip Check the power at your site to ensure that you are receiving "clean" power (free of spikes and noise). Install a power conditioner if necessary.

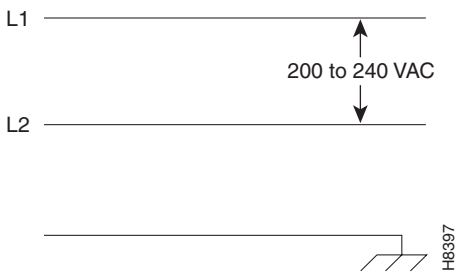
Caution Consult Cisco Customer Service if the plans for the system's AC power include an uninterruptible power source (UPS). It is recommended that you use a UPS with a low output impedance and the capacity to provide the necessary fault current to trip the protection devices. If the UPS cannot provide the fault current, the UPS must be equipped with a fault bypass switch that can trip the protection devices through the utility power. Do not use a UPS or any power source with a Ferro-Resonant transformer.

Caution For mission-critical applications, it is recommended that you use the dual AC power input tray with dual AC power cords, so that there can be no single or primary power failure.

The power receptacles to which the switch connects must be of the grounding type. The grounding conductors that connect to the receptacles should connect to protective earth at the service equipment. Figure 3-13 shows the hookup schematic in the three-wire wall plug.

For AC power cord details (part numbers and countries), see Table 3-29 on page 3-67.

Figure 3-13 Schematic of AC Plug Wiring



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DC Power

DC power is supplied to the MGX 8880 Media Gateway through one or two DC PEMs. Each DC PEM must be connected to a dedicated 60-A regulated source. Each branch circuit must have a 60-A circuit breaker at the source.

Wires connecting the PEMs to the sources should be capable of carrying 60 A. A 6-AWG (10-square mm) copper wire is recommended. Consult the local or national codes for conductor sizing for DC supply connections if necessary.

Note For more information about the DC PEM, see the "DC Power Entry Module" section on page 1-30.

DC power sources must be dedicated DC branch circuits. Each branch circuit must be protected by a dedicated circuit breaker. The circuit breaker must have a rated trip delay time greater than that of the MGX 8880 Media Gateway circuit breaker.

The MGX 8880 Media Gateway uses a 60-A, 1-pole circuit breaker with a short trip delay on each –48 V input. It is recommended that the site have a dedicated 60-A, 1-pole circuit breaker with a medium trip delay at each branch circuit.

Connect the safety grounding wire to a solid earth ground. It is recommended that you use a ring terminal lug to terminate the ground conductor at the ground stud. For details, see the "Bonding and Grounding the Cisco MGX System" section on page C-8.

Caution The –48 VDC return, logical grounds, and safety grounds are connected to the equipment chassis; therefore, you must use a low-impedance connector to connect the chassis ground to the earthing ground.

Note Connect the MGX 8880 Media Gateway only to a –48 VDC source that complies with the SELV requirements in UL 1950, IEC 950, EN 60950, and CSA C22.2 No. 950-95.

Power Consumption Calculation Tables

You can use Table 3-28 to calculate the typical power requirement for a MGX 8880 Media Gateway.

Table 3-28 Power Consumption Calculation for MGX 8880 Media Gateway Components

	A	B	C	D
Front Card	**Number of Cards Installed**	**Watts per Card**	**Total Card Power (AxB)**	**Total 48-V Current (ADC) (C/48)**
AXSM-1-2488/B		85.8		
• SMFLR-1-2488/B		19.4		
• SMFSR-1-2488/B		19.4		
• SMFXLR-1-2488/B		19.4		
AXSM-2-622-E		80		
• SMFIR-1-622/C		12		

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Table 3-28 Power Consumption Calculation for MGX 8880 Media Gateway Components (continued)

Front Card	A Number of Cards Installed	B Watts per Card	C Total Card Power (AxB)	D Total 48-V Current (ADC) (C/48)
• SMFLR-1-622/C		12		
AXSM-4-622/B		94.6		
• SMFIR-2-622/B		12		
• SMFLR-2-622/B		12		
AXSM-8-155-E		80		
• MMF-4-155/C		21.3		
• SMB-4-155		25		
• SMFIR-4-155/C		12		
• SMFLR-4-155/C		12		
AXSM-16-155/B		94.6		
• MMF-8-155-MT/B		21.3		
• SMB-4-155		25		
• SMFIR-8-155-LC/B		12		
• SMFLR-8-155-LC/B		12		
AXSM-16-T3E3/B		94.6		
• SMB-8-E3		10		
• SMB-8-T3		10		
AXSM-16-T3E3-E		80		
• SMB-8-E3		10		
• SMB-8-T3		10		
AXSM-32-T1E1-E		110		
• MCC-16-E1		5		
• RBBN-16-T1E1		5		
PXM45/C		121		
• PXM-UI-S3		4		
• PXM-HD		9		
RPM-PR-256		44		
• MMF-FE		3.03		
• RJ45-4E/B		1.25		
• RJ45-FE		3.03		
RPM-PR-512		45		
• MMF-FE		3.03		
• RJ45-4E/B		1.25		

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Table 3-28 Power Consumption Calculation for MGX 8880 Media Gateway Components (continued)

Front Card	A Number of Cards Installed	B Watts per Card	C Total Card Power (AxB)	D Total 48-V Current (ADC) (C/48)
• RJ45-FE		3.03		
RPM-XF-512		85		
• MGX-XF-UI		3		
• MGX-1OC12POS-IR		13		
• MGX-1GE		11		
• MGX-2OC12POS-IR		15		
• MGX-2GE		13		
SRME/B		27.5		
• SMFIR-1-155		4.1		
• STM1-EL-1		6.3		
VISM-PR-8E1		60		
• MGX-RJ48-8E1		3		
• RJ48-8E1		3		
• R-RJ48-8E1		3		
• SMB-8E1		5		
• R-SMB-8E1		5		
VISM-PR-8T1		60		
• RJ48-8T1		3		
• R-RJ48-8T1		3		
VXSM-4-155		160		
• VXSM-BC-4-155		8		
• VXSM-R-BC		9		
VXSM-48T1E1		110		
• VXSM-BC-24T1E1 (used in pairs)		9		
VXSM-3-3T3				
• VXSM-BC-3T3				
Fan tray (for each)		75.6		
DC PEM		20		
Totals				

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Required Tools and Equipment

Table 3-29 lists the tools and equipment that you need to install and remove MGX 8880 Media Gateway components.

Note For additional cabling requirements, see Appendix B, "Cable Specifications."

Table 3-29 MGX 8880 Media Gateway Required Tools and Equipment

Check	Tools and Equipment
	Hardware Components and Cables
	MGX 8880 Media Gateway, with the front cards and back cards installed
	If your configuration was not installed in a Cisco-supplied cabinet, you will need the following components for your system: • Cabinet or rack that meets the RETMA Standard EIA-310-D requirements. **Note** Note that ***three*** MGX 8880 DC gateways fit in a seven-foot rack. • Air intake plenum (3.5 inches, 2 RU) • Exhaust plenum/fan tray (these are combined for the MGX 8880 in a 3.5 inch, 2RU unit) • Optional for AC-powered system: AC power supply tray with power supplies • DC PEM—for DC-powered systems
	Blank front card faceplates, as needed: • Single-height service module: Cisco Part Number SINGLE SM-CVR • SRME: Cisco Part Number SRM-CVR • Double-height service module: Cisco Part Number DOUBLE SM-CVR • PXM45 or PXM1E: Cisco Part Number PROCESSOR CVR Back card blank faceplates, as needed: • For single-height back cards: Cisco Part Number 800-215911-00. **Warning** **Blank faceplates and cover panels serve three important functions: they prevent exposure to hazardous voltages and currents inside the chassis; they contain electromagnetic interference (EMI) that might disrupt other equipment; and they direct the flow of cooling air through the chassis. Do not operate the system unless all cards, faceplates, front covers, and rear covers are in place. Statement 1029**
	Mounting kit option for 23-inch rack: Cisco Part Number MGX-MNT23
	Cable management assembly: Cisco Part Number MGX-CAB-MGMT
	Switch earthing conductor—Minimum of 6 AWG stranded copper wire, rated at minimum 90°C
	APS connector, as necessary—Cisco Part Number MGX-8850-APS-CON or MGX-APS-CON

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Table 3-29 MGX 8880 Media Gateway Required Tools and Equipment (continued)

Check	Tools and Equipment
	Fan tray power cable
	DC PEM power cable—For DC-powered systems
	Optional AC power supply tray power cable—For AC-powered systems
	AC power cord for AC power supply tray, optional for AC power: • Argentina: Cisco Part Number CAB-ACR • Australia: Cisco Part Number PWRCD-ANZ • Continental Europe: Cisco Part Number PWRCD-EU • Great Britain: Cisco Part Number PWRCD-GBI • Ireland: Cisco Part Number PWRCD-GBI • Italy: Cisco Part Number PWRCD-IT • Japan: Cisco Part Number PWRCD-NA • New Zealand: Cisco Part Number PWRCD-ANZ • North America: Cisco Part Number PWRCD-NA (NEMA L6-20 twistlock plug)
	Wire for DC power connection—6 AWG (10 square mm) or larger three-wire solid or stranded copper wire with insulation rating for 140°F (60°C)
	Stability plate kit, optional—Cisco Part Number STRATM-STAB
	ESD protection equipment—Required whenever you handle Cisco equipment, which includes the switch, cards, and modules
	Mounting screws—To mount the Cisco MGX 8880 Media Gateway, exhaust plenum/fan tray, air intake plenum, and optional AC power supply tray in the rack
	Tools
	Small- and medium-sized flat-blade screwdrivers
	Small- and medium-sized Phillips screwdrivers
	3-in-1 tool (part 700-07569-01) with the following heads: • A flat head for unlatching front card ejectors and loosening and tightening the back card captive screws • A hex head for unlatching the chassis door • A Phillips head for loosening and tightening the back card captive screws
	Power screwdriver, optional
	Wire stripper
	Wire-wrapping tool, optional
	Fuse replacement tool (218090-00). **Warning** **This tool should only be used by trained personnel.**

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Rack-Mounting Requirements

Warning **To prevent bodily injury when mounting or servicing this unit in a rack, you must take special precautions to ensure that the system remains stable. The following guidelines are provided to ensure your safety:**

—This unit should be mounted at the bottom of the rack if it is the only unit in the rack.

—When mounting this unit in a partially filled rack, load the rack from the bottom to the top with the heaviest component at the bottom of the rack.

—If the rack is provided with stabilizing devices, install the stabilizers before mounting or servicing the unit in the rack. Statement 1006

Adhere to the following rack-mounting guidelines and requirements when mounting an MGX chassis:

- The chassis and components fit in either a 19-inch wide rack or a 23-inch wide rack. If the chassis and components are installed in a 23-inch wide rack, extender brackets must be installed.
- When installed in the rack, consider the following:
  - ensure that the vertical hole spacing on the rack rails meets industry standard (EIA/Retma) mounting hole pattern requirements.
  - it must be mid-mounted between the rack rails
  - it must be front mounted and supported by rear support brackets.
- When situating the mounted chassis, allow enough room to access the back of the unit for cabling and wiring purposes.

Caution Make sure that mounting the equipment does not create a hazardous condition due to uneven loading. The equipment rack should be securely supported.

Unpacking the Box

Each Cisco MGX switch or gateway is securely packaged in a shipping box. The MGX switch modules and cards ship installed in the chassis. If your switch is ordered to be installed in a cabinet as well, the components are installed in the cabinet (for example, upper and lower fan trays, air intake plenum, and exhaust plenum).

Caution Proper ESD protection is required whenever you handle Cisco equipment. Installation and maintenance personnel should be properly grounded through the use of grounding straps to eliminate the risk of ESD damage to the equipment. Modules are subject to ESD damage whenever they are removed from the chassis.

To unpack the shipping container, follow these steps:

Step 1 Inspect the packing containers.

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If any damage or other signs of mishandling are evident, inform both the local freight carrier and Cisco before unpacking. Your freight carrier can provide you with the procedures necessary to file a claim for damages.

Step 2 Carefully open the box.

Step 3 Remove all packing material.

Step 4 Remove the chassis from the box.

Step 5 Carefully open the additional boxes, remove the packing material, and remove the contents.

Step 6 Open the accessory kits and boxes that contain the cables, management software, and so forth. Do not use a knife to open these boxes.

Verifying Contents

To verify that your shipment is complete, make sure that you received everything on your packing list, and then compare your packing list to your order.

If any items are missing or if you need additional information, contact the Cisco Technical Assistance Center (TAC) at one of the following:

- 800/553-2447
- 408/526-7209
- tac@cisco.com

Inspecting for Damage

After you verify that all of the equipment is included, carefully examine the assemblies, cards, modules, and cables for any damage resulting from shipping. If you suspect any damage from shipping, contact your local freight carrier for procedures on damage claims.

If you observe any physical defects in the items you ordered, obtain standard warranty service by delivering the defective part, accompanied by a copy of the dated proof-of-purchase, to the Cisco Systems Corporate Service Center or an authorized Cisco Systems service center during the applicable warranty period. Contact the Cisco TAC for the location of your nearest service center.

Note Before proceeding with the installation, verify that all of the ordered parts are present and in good condition. Keep a record of the parts and serial numbers. If any parts are missing or damaged, contact your sales representative.

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Planning for Card Redundancy, Line Redundancy, and Bulk Distribution

This chapter describes how to plan for card redundancy, line redundancy, and bulk distribution on MGX switches. The card redundancy feature uses a secondary card of the same or similar type (MPSM-8-T1E1 cards support other card types) to serve as a standby card and to take over if the active card fails. The line redundancy feature extends this same type of fault tolerance to individual lines connected to the switch. (In this chapter, *switch* refers to the MGX switches and the MGX 8880 gateway.)

Bulk distribution is a feature that uses an SRM card to aggregate T1 or E1 traffic from selected service modules and transmit that traffic over higher speed back cards connected to the SRM. Aggregated traffic received at the SRM cards is distributed to the individual service modules. The primary feature of bulk distribution is that it enables a switch to use fewer T3 or OC-3 lines instead of many T1 or E1 lines. A secondary benefit is that SRME cards can provide line redundancy to cards that otherwise could not use that feature.

Because a configuration change for any of these services has the potential to interrupt service and can require substantial configuration teardown, it is important to develop a plan for these services early. This plan determines how controller cards and service modules must be installed in the chassis, and how lines must connect to the cards before configuration starts. Once the hardware is installed, the software configuration team uses this plan to configure the switch. For the switch to operate properly, the hardware installation must match the planned software configuration.

The features described in this chapter are not supported on all cards. Table 4-1 lists all the card types and the features they support.

Table 4-1 Card Redundancy, Line Redundancy, and Bulk Distribution Features per Card

Card Type	Card Redundancy Options	Line Redundancy Supported	Bulk Distribution Supported
AUSM8T1/B[1] AUSM8E1/B[1]	Standalone	None[2]	Yes
	1:N		
AXSM-1-2488 AXSM-1-2488/B AXSM-1-9953-XG	Standalone	None	No
	1:1	Intercard APS	
AXSM-2-622-E	Standalone	None	No
	1:1	Intercard and intracard APS	

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Table 4-1 Card Redundancy, Line Redundancy, and Bulk Distribution Features per Card (continued)

Card Type	Card Redundancy Options	Line Redundancy Supported	Bulk Distribution Supported
AXSM-4-622 AXSM-4-622/B AXSM-4-2488-XG	Standalone	Intracard APS	No
	1:1	Intercard and intracard APS	
AXSM-8-155-E	Standalone	Intracard APS	No
	1:1	Intercard and intracard APS	
AXSM-16-155 AXSM-16-155/B AXSM-16-155-XG	Standalone	Intracard APS	No
	1:1	Intercard and intracard APS	
AXSM-16-T3E3 AXSM-16-T3E3/B AXSM-16-T3E3-E AXSM-32-T1E1-E	Standalone	None	No
	1:1		
CESM-8E1[1] CESM-8T1[1] CESM-8T1/B	Standalone	None[2]	Yes
	1:N		
FRSM-2CT3 FRSM-2T3E3	Standalone	None	No
	1:1		
FRSM-8E1[1] FRSM-8E1-C[1] FRSM-8T1[1] FRSM-8T1-C[1]	Standalone	None[2]	Yes
	1:N		
FRSM-12-T3E3	Standalone	None	No
	1:1		
FRSM-HS2/B	Standalone	None	No
	1:1[3]		
MPSM-8-T1E1	Standalone	None[2]	Yes
	1:N		
MPSM-16T1E1	1:1	None	No
	1:N		
MPSM-T3E3-155	Standalone	Intracard APS	No
	1:1	Intercard and intracard APS	
PXM1E-4-155 PXM1E-8-155	Standalone	Intracard APS	No
	Preconfigured 1:1	Intercard and intracard APS	
PXM1E-8-T3/E3 PXM1E-16-T1/E1	Standalone 1:1	None	No
	Preconfigured 1:1		
PXM1E COMBO	Standalone	Intracard APS	No
	Preconfigured 1:1	Intercard and intracard APS	

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Table 4-1 Card Redundancy, Line Redundancy, and Bulk Distribution Features per Card (continued)

Card Type	Card Redundancy Options	Line Redundancy Supported	Bulk Distribution Supported
PXM45 PXM45/B PXM45/C	Standalone	None	No
	Preconfigured 1:1		
RPM-PR-256 RPM-PR-512 RPM-XF-512	Standalone	None	No
	1:N without SRM		
SRM-3T3	Standalone	None	Yes
	Preconfigured 1:1		
SRME	Standalone	None	Yes
	Preconfigured 1:1	Intercard APS	
SRME/B	Standalone	None	Yes
	Preconfigured 1:1	Intercard APS[4]	
VISM-PR-8E1 VISM-PR-8T1	Standalone	None	Yes
	1:N		
VXSM-4-155	Standalone	Intracard APS	No
	1:1	Intercard and intracard[5] APS	
VXSM-48-T1E1	Standalone	None	No
	1:1		
VXSM-T3	Standalone	None	No
	1:1		

1. MPSM-8-T1E1 can replace or serve as a standby card for this card type.
2. When bulk distribution is used with redundant PXM1Es and SRMEs or SRME/Bs, intercard APS line redundancy (through the SRME) is supported.
3. 1:1 redundancy supported only with the SCSI2-2HSSI/B back card and a FRSM-HS1/B HSSI Y-cable. 1:1 redundancy is not supported in slots that use the 12IN1-8S back card.
4. SRME/B supports T3, SONET, and SDH interfaces. Intercard APS is available only on SONET and SDH interfaces.
5. VXSM intracard APS is supported only on 1:1 redundant card installations in MGX 8880 slots 3 and 4.

Planning Standalone and Redundant Card Configurations

A PXM card or service module operates in either standalone mode or redundant mode, depending on the card type, the other cards in the switch, and the configuration applied to that card. The following subsections provide planning guidelines for installing cards that will operated in standalone and redundant configurations.

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Standalone Card Configuration Guidelines

When a card is inserted in a switch without a standby or redundant card, it operates in standalone mode. If a standalone card goes down, all the connections on that card will fail and traffic will be lost. All cards that can be installed in an MGX switch can operate in standalone mode. However, Cisco recommends configuring redundancy to ensure that you will not lose traffic and connectivity in the event of a card or line failure.

All Cisco MGX 8850switch cards operate in the standalone configuration without additional configuration. Standalone configurations are often used in lab environments or other non-critical applications.

In the standalone configuration, the appropriate back cards must be installed according to the following guidelines:

- For all PXM cards, both back cards must be installed.
- For AXSM, FRSM12, and VXSM cards that support two back cards, at least one back card must be installed.
- For RPM cards, install back cards according to the requirements for your installation.
- For MGX 8880 installations, redundancy back cards must be installed in slots 4 an 20, and this makes front card slot 4 impractical for standalone use. (Technically, a standalone card in slot 4 can connect to back cards in slot 3, but it is more practical and intuitive to have all standalone front and back cards in slot 3.)
- For all other service modules, one back card must be installed or bulk distribution must be configured.

SRM cards are optional and add 1:N card redundancy, bulk distribution, and bit error rate testing (BERT) services to a Cisco MGX 8850switch. These services apply to select service modules, so in a MGX 8850 (PXM45) switch, for example, you can install a standalone PXM and still support 1:N card redundancy for select service modules.

When you install SRM cards, it is important to note the relationship between the SRM cards and the PXM cards, which is shown in Table 4-2. For example, in a MGX 8850 (PXM1E) switch, the PXM in slot 7 is preconfigured to work with SRMs in slots 15 and 31. The SRM in slot 15 provides SRM services to the upper bay, and the SRM in slot 31 provides SRM services in the lower bay.

Table 4-2 Preconfigured Relationship Between PXM and SRM Cards

Switch	PXM Slot	Upper Bay SRM Slot	Lower Bay SRM Slot
MGX 8830 and MGX8830/B	1	7	—
	2	14	—
MGX 8850 (PXM1E/PXM45), MGX 8850/B, and MGX 8880	7	15	31
	8	16	32

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Because the relationship between PXM and SRM cards is preconfigured and cannot be changed during configuration, it is important to install these cards using the configuration options listed in Table 4-2. Use the following guidelines when installing PXM and SRM cards:

- When using a standalone PXM configuration, the switch supports a single standalone SRM per bay.
- For the MGX 8830, a standalone SRM provides services to all cards in the switch and must be installed in the slot that supports the standalone PXM. For example, if the standalone PXM is installed in slot 1, the standalone SRM must be installed in slot 7.
- For the MGX 8850 (PXM1E/PXM45) switches and the MGX 8880 Media Gateway, up to two standalone SRMs can be installed to provide SRM services to the upper and lower bays. For example, when a standalone PXM is installed in slot 8, a standalone SRM in slot 16 can provide SRM services to the upper bay, and a standalone SRM in slot 32 can provide SRM services to the lower bay.
- When installing two standalone SRMs in MGX 8850 (PXM1E/PXM45) switches, you can install different SRM card types in different bays. For example, you can install an SRM-3T3/C card in one bay and an SRME/B card in the other bay.
- SRME/B is the only SRM supported on the MGX 8880 Media Gateway.
- SRM cards are not supported on MGX 8950 switches.

1:1 Redundant Card Configuration Guidelines

The 1:1 redundant card configurations provide the optimum protection against failure of a single card. In the 1:1 redundant card configuration, one card operates in the active mode and a second card operates in hot standby mode, ready to provide services in the event of an active card failure. To minimize switchover time and prevent service interruption, standby cards are dedicated to a single active card and cannot support additional cards. Standby cards do not support services until they transition to the active state.

Note To prevent total switch service interruption in the event of a PXM card failure, Cisco recommends using redundant PXM cards.

There are two types of 1:1 redundant card configurations on Cisco MGX 8850switches, preconfigured redundancy and configured redundancy. The following sections describe these redundancy types and provide guidelines for installing cards to support these configurations.

Note The 1:1 card redundancy configuration is sometimes referred to by the older term, *Y-cable redundancy.* This is because older card sets always used Y cables to connect both 1:1 redundant cards to the same communications line. However, with the addition of APS line redundancy, it is very common to have 1:1 redundant cards that do not use Y cables, so this guide uses the term *1:1 card redundancy.*

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Preconfigured Redundancy (PXM and SRM)

Cisco MGX 8850switches are preconfigured to support redundant PXM and SRM cards. If you want to use redundant PXM and SRM cards, simply install cards in the appropriate slot as described in Table 4-3.

Table 4-3 Preconfigured Redundancy for Cisco MGX 8850Switches

Switches	Redundancy Role	PXM Slot	Upper Bay SRM Slot	Lower Bay SRM Slot
MGX 8830 and MGX 8830/B	Primary	1	7	—
	Secondary	2	14	—
MGX 8850 (PXM1E/PXM45), MGX 8850/B and MGX 8880	Primary	7	15	31
	Secondary	8	16	32
MGX 8950	Primary	7	—	—
	Secondary	8	—	—

SRM cards are optional and add 1:N card redundancy, bulk distribution, and bit error rate testing (BERT) services to a Cisco MGX 8850switch. These services apply to select service modules, so in a MGX 8850 (PXM45) or MGX 8850/B switch, for example, you might use 1:1 card redundancy for some cards and 1:N redundancy for others.

When you install SRM cards, it is important to note the relationship between the SRM cards and the PXM cards, which is shown in Table 4-3. For example, in a MGX 8850 (PXM1E) switch, the primary preconfigured card set is a PXM in slot 7, an SRM covering the upper bay in slot 15, and an SRM covering the lower bay in slot 31. The secondary configuration is a PXM in slot 8, an SRM covering the upper bay in slot 16, and an SRM covering the lower bay in slot 32. If the primary card set fails, a switchover to the secondary card set is initiated. Figure 4-1 and Figure 4-2 show the card positions for PXM and SRM cards in the switches that support SRM cards.

Figure 4-1 MGX 8850 Switch or MGX 8880 Media Gateway with Redundant PXMs and SRMs

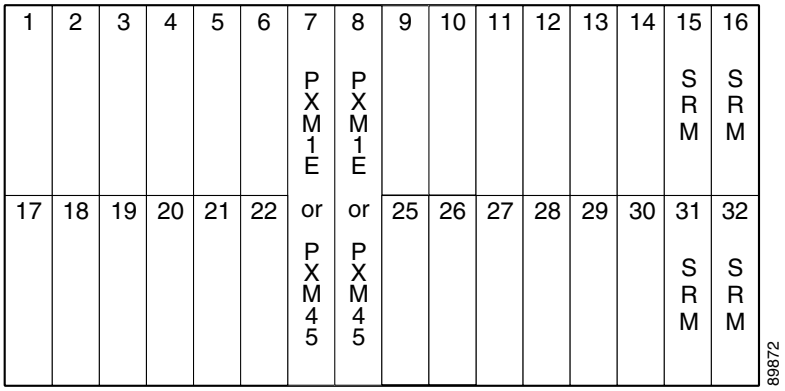

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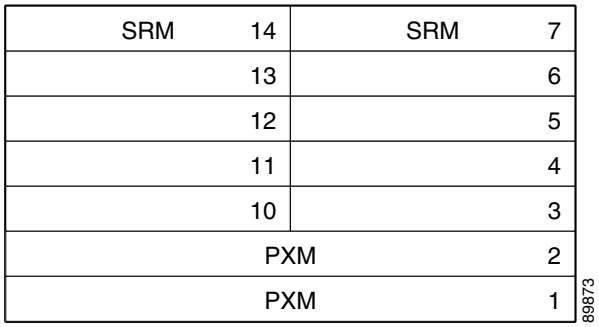
Figure 4-2 MGX 8830 Switch with Redundant PXMs and SRMs



Because the relationship between PXM and SRM cards is preconfigured and cannot be changed, it is important to install these cards in the proper slots to support the intended configuration. Use the following guidelines when installing PXM and SRM cards:

- For redundant PXM1E installations, the card sets must be identical.
- If redundant PXMs are used and SRM services are required, redundant SRMs must be installed for each bay that uses SRM services.
- For the MGX 8830 or MGX 8830/B, a redundant pair of SRMs provides services to all service module slots in the switch.
- For the MGX 8850 (PXM1E/PXM45), MGX 8850/B switches and the MGX 8880 Media Gateway, a redundant pair of SRMs provides services to only one bay. For example, to support redundant SRM services in the lower bay, SRM cards must be installed in slots 31 and 32.
- When installing redundant SRMs for a MGX 8830 or MGX 8830/B switch or a single bay in a MGX 8850 (PXM1E/PXM45) or MGX 8850/B switch, the redundant SRMs must use compatible configurations. The switch cannot support two different SRM configurations in the same bay. The following are valid SRM redundant configurations:
  - Two SRM-3T3/C
  - One SRM-3T3/C and one SRME/B with a BNC-3T3-M back card.
  - Two SRME
  - Two SRME/B
  - One SRME and one SRME/B
- The MGX 8880 Media Gateway supports only the SRME/B.
- When redundant SRMs are installed, both SRMs must use the same back card type.
- When installing redundant SRMs in a MGX 8850 (PXM1E/PXM45) or MGX 8850/B switch or a MGX 8880 Media Gateway, you can install one SRM configuration in one bay and another type of SRM configuration in the other bay. For example, the top bay might use SRME/B services and BNC-3T3-M back cards, and the bottom bay might use SRME/B services and MGX-SMFIR-1-155 back cards.
- SRM cards are not supported on MGX 8950 switches.

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Configured 1:1 Card Redundancy

Configured 1:1 card redundancy operates much like 1:1 PXM redundancy. The difference is that the redundancy is not preconfigured. To use configured 1:1 card redundancy with cards such as AXSM, FRSM12, and VXSM cards, the cards must be installed in the appropriate slots, and the cards must be configured to operate as a redundant pair. After configuration, one card operates in active mode, and the other card operates in hot standby mode. If the active card fails, the standby card takes over, and no calls are lost.

Note This configuration provides fault tolerance for the service modules only. Some cards, such as selected AXSM, PXM1E, and VXSM cards, support line redundancy. For more information on planning for line redundancy, see "Redundant Line Configuration Guidelines," which appears later in this chapter.

When planning a configured 1:1 card redundancy configuration, consider the following:

- Configured 1:1 card redundancy is supported by many service module families. Refer to Table 4-1 to see which service modules support 1:1 card redundancy.
- When redundant cards are connected to a standalone line, the cards can be placed in any available slots; they do not have to be installed in adjacent slots, although doing so makes the cabling easier.
- When redundant cards are connected to redundant lines using intercard APS, the cards must be placed in adjacent slots. For more information, see "Redundant Line Configuration Guidelines," which appears later in this chapter.
- When redundant cards are connected to redundant lines using intercard APS in a MGX 8950 switch, you must install redundant AXSM-XG cards in adjacent slots where the odd numbered slot is the lower number. For example, you can install redundant AXSM-XG cards in slots 3 and 4. However, if you install redundant AXSM-XG cards in slots 4 and 5, intercard APS cannot be configured for these cards.
- The front cards must be identical. If you install non-matching cards, such as an AXSM OC-48 card and a AXSM OC-3 card, these cards cannot be configured as a redundant pair.
- The back card sets must be compatible. For T1, E1, T3, and E3 interfaces, this means that the back cards must be identical. For optical and STM-1 interfaces, the back cards must use the appropriate speed based on the front card, but you can use different interface types. For example, if a service module supports single mode and multimode fiber interfaces, you can use both interface types in the same redundant card set.
- The cards must be cabled and configured for standalone lines (Y-cables) or redundant lines (APS). Although cards can be configured before the cabling is installed, the redundant card set will not operate properly until the correct cabling is installed between the redundant card pair. For more information, see "Planning for Standalone and Redundant Line Configurations," which appears later in this chapter.

1:N Redundant Card Configuration Guidelines (Except RPM)

1:N card configurations use one standby card to back up multiple active cards. If an active card fails, the standby card loads the proper configuration and takes over operation for the active card. Once the standby card transitions to the active mode, it is no longer available to back up other active cards.

With the exception of 1:N redundant configurations on RPM cards, 1:N redundant card configurations always require the services of one or more SRM cards.

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SRM cards support 1:N redundancy in the following modes:

- 1:N redundancy without bulk distribution
- 1:N redundancy with bulk distribution

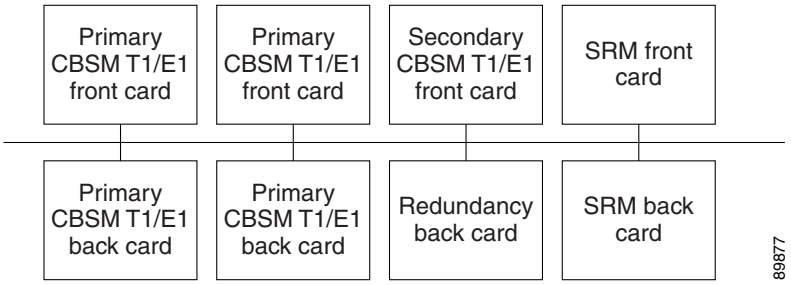
The following subsections describe how 1:N redundancy operates in these two configurations and provide guidelines for installing cards to support 1:N redundant configurations.

1:N Redundancy without Bulk Distribution

When 1:N redundancy is used without bulk distribution, you must install a special redundancy back card for each 1:N redundant card set as shown in Figure 4-3. This redundancy back card has no connectors on it and is installed behind the standby card.

If an active card in the 1:N redundant card set fails, the standby card takes over, and the SRM routes communications from the standby back card through the special redundancy back card, and over to the back card behind the failed card. This configuration allows the standby card to use the lines connected to the back card behind the failed primary card.

Figure 4-3 Example 1:N Redundant Configuration without Bulk Distribution



The rerouting of the line communications takes place over a single redundancy bus, one of which is installed in each bay of a Cisco MGX 8850switch. A MGX 8830 or MGX 8830/B switch has one redundancy bus, and MGX 8850 (PXM1E/PXM45), MGX 8850/B, and MGX 8880 switches have two, one for each bay. The redundancy bus is available to only one 1:N redundant card set at a time, so if any 1:N protected card fails in a bay, the redundancy bus is unavailable to all other 1:N redundant card sets.

To support 1:N redundancy without bulk distribution, cards must be installed according to the following guidelines:

- The SRM-3T3/C, SRME, and SRME/B cards provide 1:N card redundancy for 8-port AUSM, FRSM, CESM, MPSM, and VISM-PR cards that use T1 and E1 lines. Refer to Table 4-1 to see if a specific service module supports 1:N card redundancy.
- All cards in a 1:N redundant card set (without bulk distribution) must have back cards. Each primary card must have an appropriate back card with line connections, and the secondary card must have the appropriate redundancy back card.
- The primary back cards in a 1:N redundancy set must all be of the same interface type. For example, all of the cards should be either T1 or E1 back cards. Do not mix interface types in the same redundancy set.
- When the secondary card is an AUSM, CESM, FRSM, or VISM, all cards in a 1:N redundant card set must be of the same type. For example, a FRSM-8T1 can act as a standby card for other FRSM-8T1 cards; it cannot serve as a standby card for an AUSM-8T1/B.

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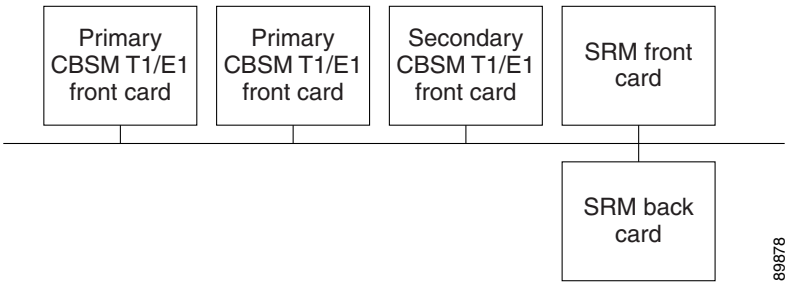
- When the secondary card is an MPSM-8-T1E1, the MPSM-8-T1E1 can back up the following card types: AUSM, FRSM, CESM and MPSM-8-T1E1. For example, the same MPSM-8-T1E1 could simultaneously serve as a secondary card for AUSM, FRSM, CESM and MPSM-8-T1E1 cards.
- All cards in a 1:N redundant card set must be installed in the same bay. For example, in a MGX 8850 (PXM1E/PXM45) or MGX 8850/B switch, all cards in a specific 1:N redundant card set must be installed in the upper bay or in the lower bay. The 1:N redundant card set cannot be split between the upper and lower bays.
- SRMs must be installed in each bay that supports 1:N redundancy, and the number of SRMs in that bay must match the number of installed PXMs and be placed as described in "Standalone Card Configuration Guidelines" or "1:1 Redundant Card Configuration Guidelines."

1:N Redundancy with Bulk Distribution

Bulk distribution is an SRM card feature that combines communications paths from multiple T1 or E1 lines on individual service modules and forwards those communications over T3 or OC-3 lines connected to SRM back cards. Communications received over the SRM T3 or OC-3 lines are separated into individual T1 or E1 data streams and forwarded to the appropriate service module. Bulk distribution enables you to use one T3 or OC-3 line for service module communications instead of multiple T1 or E1 lines.

When 1:N redundancy is used with bulk distribution, no back cards are installed behind service modules in a 1:N redundant card set. All communications lines for the protected cards are rerouted through the backplane to the SRM back card as shown in Figure 4-4.

Figure 4-4 Example 1:N Redundant Configuration with Bulk Distribution Enabled



If an active card in the 1:N redundant card set fails, the standby card takes over, and the SRM routes communications from the standby back card to the appropriate logical lines within the SRM T3 or OC-3 line. When bulk distribution is used, the 1:N redundant card set does not use the redundancy bus on the backplane, so the SRM can support failures in multiple 1:N redundant card sets.

To support a 1:N redundancy configuration with bulk distribution, use the following guidelines:

- SRM T3 configurations (SRM-3T3/C and SRME/B with the BNC-3T3-M back card) support bulk distribution on 8-port AUSM, FRSM, CESM, MPSM-8-T1E1, and VISM-PR cards that use T1 lines only. Refer to Table 4-1 to see if a specific service module supports bulk distribution.
- SONET and SDH configurations (SRME and SRME/B with the MGX-SMFIR-1-155 or MGX-STM1-EL-1 back cards) support bulk distribution on 8-port AUSM, FRSM, CESM, MPSM-8-T1E1, and VISM-PR cards that use T1 or E1 lines. Refer to Table 4-1 to see if a specific service module supports bulk distribution.
- All cards in a 1:N redundant card set that uses bulk distribution should not have back cards. When bulk distribution is enabled, all lines on a card are routed through the SRM.

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- When the secondary card is an AUSM, FRSM, or CESM, all cards in a 1:N redundant card set must be of the same type. For example, a FRSM-8T1 can act as a standby card for other FRSM-8T1 cards; it cannot serve as a standby card for an MPSM-8-T1E1.
- When the secondary card is an MPSM-8-T1E1, the MPSM-8-T1E1 can back up the following card types simultaneously: AUSM, FRSM, CESM, and MPSM-8-T1E1.
- All cards in a 1:N redundant card set must be installed in the same bay. For example, in a MGX 8850 (PXM1E/PXM45) or MGX 8850/B switch, all cards in a specific 1:N redundant card set must be installed in the upper bay or in the lower bay. The 1:N redundant card set cannot be split between the upper and lower bays.
- SRMs must be installed in each bay that supports 1:N redundancy, and the number of SRMs in that bay must match the number of installed PXMs and be placed as described in "Standalone Card Configuration Guidelines" or "1:1 Redundant Card Configuration Guidelines."
- Enabling bulk distribution does not prevent you from using 1:N redundancy without bulk distribution. For example, in the same bay you can set up a 1:N redundancy card set with bulk distribution and a 1:N redundancy card set without bulk distribution.

1:N Redundant Card Configuration Guidelines (RPM Only)

RPM-PR and RPM-XF cards can operate in 1:N redundant card configurations without the services of SRM cards. In this configuration type, one standby RPM card takes over if any active RPM in the redundant card set fails. For more information, refer to the *Cisco MGX Route Processor Module (RPM-PR) Installation and Configuration Guide.*

Note If RPMs are installed with backcards, then the active and standby RPM backcards need to have ethernet or POS connectivity established such that the active cards and the standby card have the same IP reachability. Otherwise, IP connectivity can be disrupted by an RPM switchover.

Planning for Standalone and Redundant Line Configurations

Most cards support only standalone line configurations. Some cards, such as PXM1E, AXSM, VXSM, and SRME/B also support redundant lines. Table 4-1 lists all the card types and indicates which cards support redundant line configurations. The following subsections provide information you need to know when planning for standalone and redundant line configurations.

Standalone Line Configuration Guidelines

Standalone line configurations can be used to support standalone or redundant card configurations. However, the standalone line configuration you use will be dependent on one of the following card configurations:

- Standalone card
- 1:1 redundant card
- 1:N redundant card (except RPM)
- 1:N redundant RPM

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Standalone Card Configurations

When planning for a standalone line on a standalone card, consider the following guidelines:

- A single line (transmit and receive) should be attached to the connectors for each line. Y-cables, which are introduced later for 1:1 redundant card installations, should not be installed.
- If the standalone line is for a standalone PXM1E or SRM card, no card should be installed in the reserved redundant slot for that card.
- Slot 4 on the MGX 8880 switch is preconfigured to use redundant back cards, which physically connect the front card in slot 4 to any back cards installed in slot 3. Slot 4 cannot support a standalone configurations on its own. Therefore, it is recommended that you use slot 4 only for 1:1 redundant card configurations.

1:1 Redundant Card Configurations

When planning for a standalone line and a 1:1 redundant card configuration, consider the following guidelines:

- For most installations, a pair of Y-cables must be installed between matching line numbers on the redundant back cards, one for the transmit connector and one for the receive connector. Each Y-cable links a pair of transmit or receive connectors to the standalone line. Typically, a pair of Y-cables is required for each line that uses BNC, SMB, MCC or optical connectors. Some cards, such as the AXSM-32-T1E1-E, use special back card connectors and Y-cables that route both transmit and receive paths through a single cable.
- The redundant cards must be configured for 1:1 or “Y-cable” redundancy.
- Y-cabling of MMF backcards is possible, but must be subject to careful evaluation of the optical power budget. You must consider the following information when Y-cabling MMF interfaces:
  - The losses introduced by the Y-cable assemblies themselves, fiber connectors, patch panels, and so forth, can affect the optical power budget.
  - Single ended Y-cable deployments are typically within the acceptable optical power budget. Double ended Y-cable deployments are likely to have too much attenuation to work correctly.
  - Cisco optical Y-cables incorporate an optical splitter, which effectively divides the optical power in half to each leg of the Y-cable. This split results is an effective 3db attenuation, and this does not include the additional attenuation introduced by the Y-cable fiber connectors themselves.
- Slot 4 in the MGX 8880 uses redundancy back cards that connect the front card in slot 4 to any back cards in slot 3. Because there is only one back card set, no Y-cables are required for standalone line installations with 1:1 card redundancy in slots 3 and 4.

Note The 1:1 card redundancy configuration is sometimes referred to by the older term, *Y-cable redundancy.* This is because older card sets always used Y cables to connect both 1:1 redundant cards to the same communications line. However, with the addition of the APS line redundancy, it is very common to have 1:1 redundant cards that do not use Y cables, so this guide uses the term *1:1 card redundancy.*

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Figure 4-5 shows how redundant PXM1E cards use a Y-cable to connect to standalone lines.

Figure 4-5 Redundant PXM1E Configuration with Standalone Lines

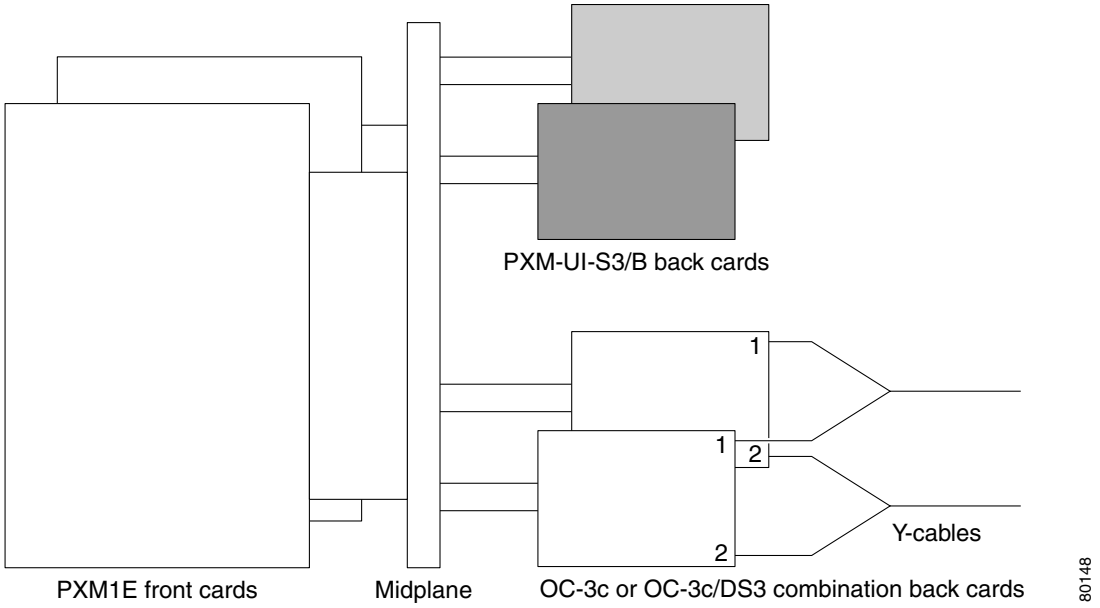
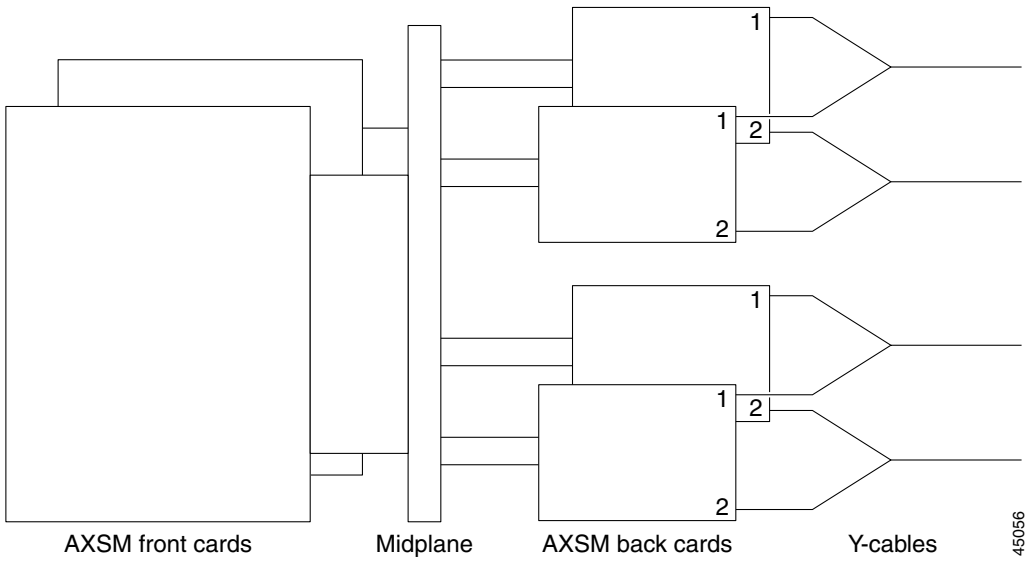


Figure 4-6 shows how redundant AXSM cards connect to standalone lines. Other service modules that support 1:1 card redundancy, such as FRSM12 and FRSM-HS2/B, use Y-cables in a similar manner.

Figure 4-6 Redundant AXSM Configuration with Standalone Lines



Note This configuration provides fault tolerance for the front cards only. This configuration does not provide fault tolerance for back cards or lines. If you need fault tolerance for back cards and lines, refer to "Redundant Line Configuration Guidelines" section on page 4-14.

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1:N Redundant Card Configurations (Except RPM)

When planning for a standalone line in a 1:N redundant card configuration, consider the following guidelines:

- A single line (transmit and receive) should be attached to the connectors for each line. Y-cables, which are introduced earlier for 1:1 redundant card installations, should not be installed.
- For 1:N redundant card configuration without bulk distribution, the redundant card set must be established according to the guidelines in "1:N Redundancy without Bulk Distribution," which appears earlier in this chapter.
- For 1:N redundant card configuration with bulk distribution, the redundant card set must be established according to the guidelines in "1:N Redundancy with Bulk Distribution," which appears earlier in this chapter.
- When bulk distribution is used on the card hosting the standalone line, the line is standalone from the service module to the SRM card. This is a single physical connection over the switch backplane. However, when the standalone line reaches the SRM, the SRME and SRME/B can be configured for redundant lines, if redundant SRMs are used with SONET, SDH, or STM-1 interfaces. When the SRME or SRME/B is configured for redundant lines, all cards that use bulk distribution through that card pair have redundant line protection. For more information, see "Redundant Line Configuration Guidelines," which appears later in this chapter.

1:N Redundant RPM Configurations

The method you use for connecting multiple RPMs to a single network will depend on the back card type. For example, if you are configuring two RPM-PRs for 1:N redundant operation over a connection to a single Ethernet 10/100 network, you would directly connect the corresponding ports or lines to a hub on that network. You would not use a Y-cable.

For more information on preparing RPM cards for 1:N redundancy, refer to *Cisco MGX Route Processor Module (RPM-PR) Installation and Configuration Guide*.

Redundant Line Configuration Guidelines

Redundant line configurations extend fault tolerance to individual lines. As with redundant cards, redundant lines operate as a pair. If one line fails, the other line in the redundant pair takes over.

Cisco MGX 8850switches use Automatic Protection Switching (APS) to provide line fault tolerance. APS is a component of SONET and is therefore available only on optical interfaces and STM-1 interfaces (which are the electrical equivalent of SONET OC-3). Table 4-1 lists all the card types and shows which cards support APS.

Note Redundant lines (APS) are not supported on T1 and E1 cards. However, SRME and SRME/B can indirectly provide redundant line protection to T1 and to E1 lines when the hosting service modules are configured for bulk distribution through a redundant SRM card set. For more information, see "Intercard APS Configurations," which appears later in this chapter.

The switch installation determines whether the switch can support APS, but APS does not operate until it is enabled and configured. When planning for APS, the hardware preparation includes:

- Placing front cards in the appropriate slots to support the planned APS configuration.
- Installing an APS connector if required.

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- Cabling working and protection lines so that the role of each line is the same at both ends of the line.

When APS is enabled and configured, the configuration must define a *working line* and a *protection line* for each redundant line pair. The working line is the primary or preferred line, and communications take place over that line as long as the line remains operative. If a failure occurs on the working line, APS initiates a switchover to the protection line. For proper APS operation between two switches a working line on one switch must also be the working line on the other switch, and the same applies to the protection line. Most service modules have specific requirements for which lines can host working lines and which can host protection lines, so proper hardware installation is required before the switch can be configured to support APS.

Cisco MGX 8850switches support two types of APS: intracard APS and intercard APS. The following subsections describe these two APS options and provide guidelines for preparing for APS configurations.

Intracard APS Configurations

Intracard APS configurations are created with the working and protection lines on the same back card or in the same back card set. As shown in Figure 4-7, intracard APS makes it possible to have redundant line protection for a standalone card configuration.

Figure 4-7 Standalone PXM1E with Intracard APS

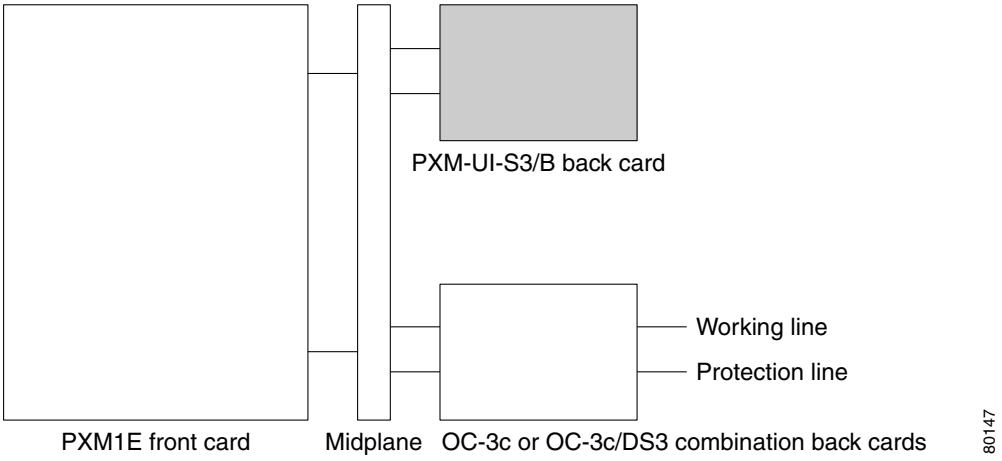

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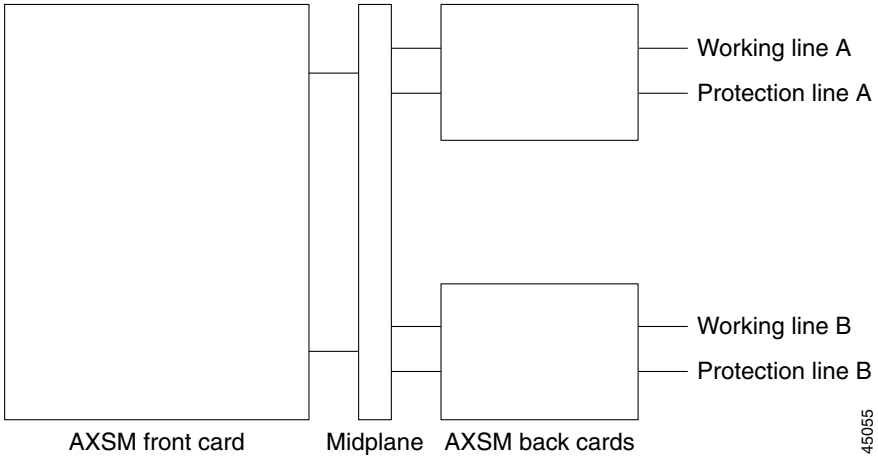
Figure 4-8 shows how a standalone AXSM connects to redundant lines.

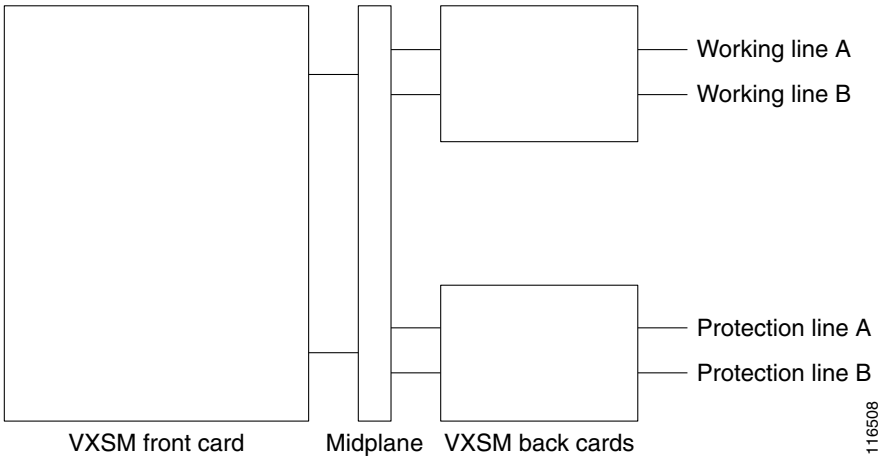
Figure 4-8 Standalone AXSM with Intracard APS



Because the front cards are far more complex and expensive than the back cards, intracard APS is not practical for most 1:1 redundant card installations. The use of intracard APS for most service modules cuts the available port count in half.

The exception to the above rule is the VXSM-4-155, which uses two 4-port back cards to double its port count. When intracard APS is used with VXSM-4-155, all four ports can be configured for intracard APS without cutting the port count. Figure 4-9 shows how a standalone VXSM connects to redundant lines.

Figure 4-9 Standalone VXSM with Intracard APS



When planning an intracard APS configuration, consider the following requirements:

- Not all cards support intracard APS. Table 4-1 lists all the card types and specifies which cards support intracard APS.
- For all cards except VXSM-4-155, the working line and the protection line must connect to adjacent ports on the same back card.

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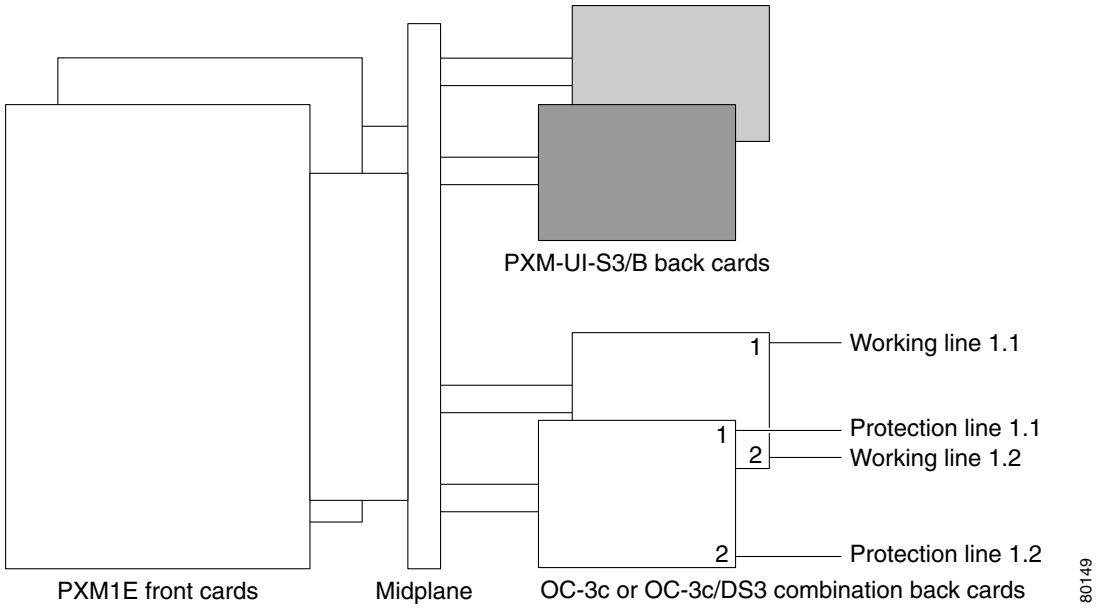
- For VXSM-4-155 cards, the working line connects to a port on the upper bay back card and the protection line connects to the corresponding port on the lower bay back card. For example, if port 2 is configured for intracard APS, the working line is connected to port 2 in the upper bay and the protection line is connected to port 2 in the lower bay.
- For all cards except VXSM-4-155, the working line must be assigned to an odd-numbered port. For example, the working line could be line 1 and the protection line could be line 2.
- For all cards except VXSM-4-155, the working line must be assigned to a lower numbered port than the protection line. For example, the working line could be on port 3 and the protection line on port 4. If the protection line is on port 2, do not assign the working line to port 3.
- The switches at both ends of the APS lines must be configured for APS, and the role of each line (working or protection) must be the same at both ends of the line.
- Slot 4 in the MGX 8880 uses redundancy back cards that connect the front card in slot 4 to any back cards in slot 3. Because slot 4 cannot support intracard APS on its own, it is recommended that you use slot 3 and not slot 4 for standalone card operation with intracard APS, or, that you use 1:1 card redundancy in slots 3 and 4 with intracard APS as described in the next section.
- Because the AXSM-1-2488, AXSM-1-9953-XG, and SRME cards have only one port on their back cards, they cannot be configured for intracard APS operation. They can be configured for intercard APS, which is described later in this chapter. This also applies to SRME/B cards that use SONET or SDH interfaces.

Intercard APS Configurations

Intercard APS configurations are created with the working and protection lines on different back cards. As shown in Figure 4-10, intercard APS makes it possible to extend the fault tolerance provided by redundant front cards to back cards and lines.

Figure 4-10 Redundant PXM1E Configuration with Intercard APS



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Back card and line fault tolerance is provided by intercard APS. If the working line or the back card to which it is connected fails, communications traffic is rerouted through the protection line and the back card to which it is connected.

Figure 4-11 shows how a redundant AXSM card set uses intercard APS.

Figure 4-11 Redundant AXSM Configuration with Intercard APS

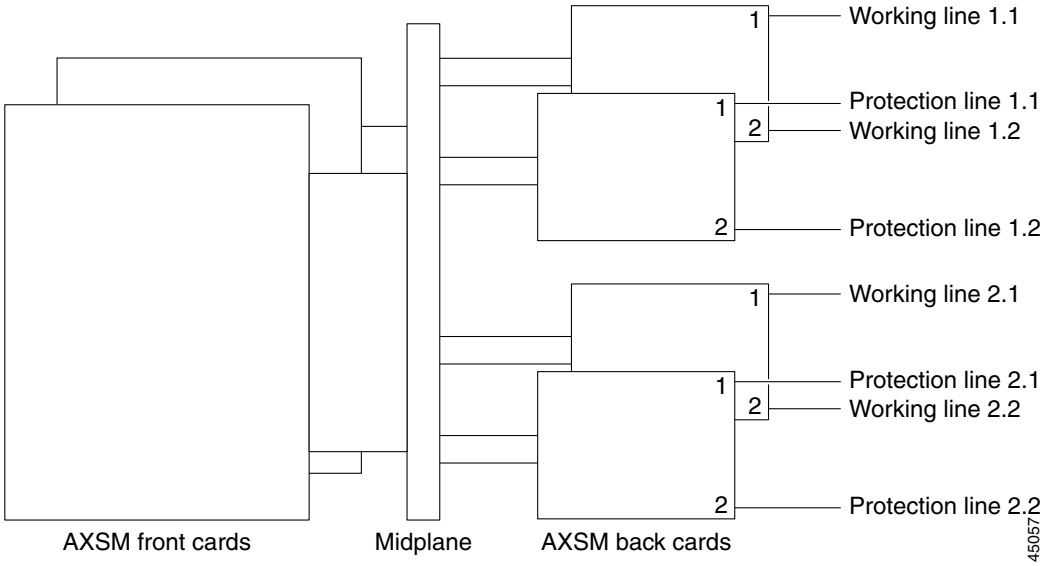
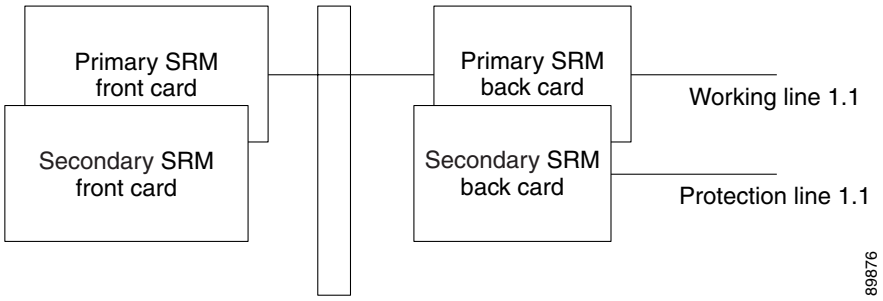


Figure 4-12 shows redundant SRMEs using intercard APS.

Figure 4-12 Redundant SRMEs with Intercard APS



When planning a redundant line configuration that uses intercard APS, consider the following requirements:

- Not all cards support intercard APS. Table 4-1 lists all the card types and specifies which cards support intercard APS.
- Card redundancy must be configured or verified as described in "1:1 Redundant Card Configuration Guidelines," which appears earlier in this chapter.
- Some PXM1E back card types require an APS mini-backplane to support intercard APS. The PXM1E APS mini-backplane requirements are listed in Table 4-4.
- Redundant AXSM, MPSM, and VXSM cards must be installed in adjacent slots to support intercard APS.

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- Some service module back card types require an APS mini-backplane to support intercard APS. The APS mini-backplane requirements are listed in Table 4-4.
- On an MGX 8880 Media Gateway, slots 3 and 4 do not support intercard APS.
- When used with SONET or SDH interfaces, the SRME/B provides the same APS support as the SRME.
- Redundant SRME and SRME/B back cards must be joined together with the APS mini-backplane. The SRME APS mini-backplane requirements are listed in Table 4-4.
- The working line must be defined on the primary card, and the protection line must be defined on the secondary card. The primary and secondary cards are predefined for PXM1E and SRM, and are defined during configuration for AXSM, MPSM, and VXSM.
- The working line and protection line numbers must be identical for intercard APS configurations. For example, you can assign the working line to line 9 on a primary PXM1E-COMBO card and the protection line to line 9 on a secondary card. You cannot assign the working line to line 9 on one card and the protection line to line 10 on the other.
- The switches at both ends of the APS lines must be configured for APS, and the role of each line (working or protection) must be the same at both ends of the line.

Table 4-4 describes the APS connector requirements for intercard APS.

Table 4-4 APS Connector Options and Requirements

Front Card Type	MGX 8830 APS Options[1]	MGX 8850 APS Options[1.]	MGX 8880 APS Options	MGX 8950 APS Options
AXSM/A Cards (labeled AXSM)				
AXSM-1-2488 AXSM-4-622 AXSM-16-155	—	Slots 1–6, 9–14: MGX-8850-APS-CON MGX-APS-CON[2]	—	—
AXSM/B Cards				
AXSM-1-2488/B AXSM-4-622/B AXSM-16-155/B	—	Slots 1–6, 9–14: MGX-8850-APS-CON MGX-APS-CON[2.]	Slots 1, 2, 5, and 6: APS connector built in. Slots 3 and 4: No intercard APS. Slots 9–14: MGX-8850-APS-CON MGX-APS-CON	Slots 1-6, 11-16: MGX-APS-CON-8950
AXSM-E Cards				
AXSM-2-622-E AXSM-8-155-E	—	Slots 1–6, 9–14: MGX-8850-APS-CON MGX-APS-CON[2.]	Slots 1, 2, 5, and 6: APS connector built in. Slots 3 and 4: No intercard APS. Slots 9–14: MGX-8850-APS-CON MGX-APS-CON	—

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Table 4-4 APS Connector Options and Requirements (continued)

Front Card Type	MGX 8830 APS Options[1]	MGX 8850 APS Options[1.]	MGX 8880 APS Options	MGX 8950 APS Options
AXSM-XG Cards				
AXSM-1-9953-XG	—	—	—	Slots 1-6, 11-16: APS connector built in.
AXSM-4-2488-XG	—	—	—	Slots 1-6, 11-16: APS connector built in.
AXSM-8-622-XG AXSM-16-155-XG	Slots 3-6, 10-13: MGX-8830-APS-CON	Slots 1–6, 9–14: MGX-8850-APS-CON MGX-APS-CON[2.]	—	Slots 1-6, 11-16: MGX-APS-CON-8950
MPSM-T3E3-155	Slots 3-6, 10-13: MGX-8830-APS-CON	Slots 1-6, 9-14, 17-22, 25-30: MGX-8850-APS-CON	—	—
PXM1E-4-155	Slots 1 and 2: MGX-8830-APS-CON	Slots 7 and 8[3]: MGX-8850-APS-CON MGX-APS-CON[4]	—	—
PXM1E-8-155	Slots 1 and 2: MGX-8830-APS-CON	Slots 7 and 8: MGX-8850-APS-CON MGX-APS-CON[4]	—	—
PXM1E-COMBO	Slots 1 and 2: APS connector built in.	Slots 7 and 8: APS connector built in.	—	—
SRME	Slots 7 and 14: MGX-8850-APS-CON	Slots 15,16, 31, 32: MGX-8850-APS-CON	Slots 15,16, 31, 32: MGX-8850-APS-CON	—
SRME/B[5]	Slots 7 and 14: MGX-8850-APS-CON	Slots 15,16, 31, 32: MGX-8850-APS-CON	Slots 15,16, 31, 32: MGX-8850-APS-CON	—
VXSM-4-155	—	Slots 1-6, 9-14: MGX-8850-APS-CON MGX-APS-CON[2.]	Slots 1, 2, 5, and 6: APS connector built in. Slots 3 and 4: No intercard APS. Slots 9–14: MGX-8850-APS-CON MGX-APS-CON	—

1. MGX 8850/B and 8830/B slots can use an APS-CON only if no RCON is installed.
2. MGX-APS-CON is not supported in the MGX 8850/B chassis. Use the MGX-8850-APS-CON connector instead.
3. MGX 8850 (PXM1E) switches do not require an APS mini-backplane to support intercard APS for PXM1E-4-155. However, Cisco recommends that you install an APS connectors on PXM1E-4-155 cards to facilitate future upgrades to the PXM1E-8-155.
4. The MGX-APS-CON connector is not supported for use with PXM1E. Use the MGX-8850-APS-CON connector instead.
5. APS connector supported only for the MGX-SMFIR-1-155 and MGX-STM1-EL-1 back cards.

Planning for Bulk Distribution

Bulk distribution is a feature that uses an SRM card to multiplex T1 or E1 traffic from selected service modules and transmit that traffic over higher speed back cards connected to the SRM. Multiplexed traffic received at the SRM cards is distributed to the individual service modules. The primary feature of bulk

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distribution is that it enables a switch to use fewer T3 or OC-3 lines instead of many T1 or E1 lines. A secondary benefit is that SRME and SRME/B cards can provide line redundancy to cards that otherwise could not use that feature.

When planning for bulk distribution, consider the following guidelines:

- Bulk distribution works with T1 and E1 service modules. Refer to Table 4-1 to see which service modules support bulk distribution.
- When a service module is configured to use bulk distribution, this service is applied to all lines on the service module and no back cards are required.
- A standalone SRM installation should be installed according to the guidelines in "Standalone Card Configuration Guidelines," which appears earlier in this chapter.
- A redundant SRM installation should be installed according to the guidelines in "1:1 Redundant Card Configuration Guidelines," which appears earlier in this chapter.
- A standalone service module installation that uses bulk distribution should be installed according to the guidelines in "Standalone Card Configuration Guidelines," which appears earlier in this chapter.
- A redundant service module installation that uses bulk distribution should be installed according to the guidelines in "1:N Redundant Card Configuration Guidelines (Except RPM)," which appears earlier in this chapter.
- A standalone or redundant SRM-3T3/C configuration can support up to 80 T1 channels, each of which supports a service module T1 port. These channels can be divided between up to 10 card slots per bay.
- A standalone or redundant SRME/B with a BNC-3T3-M back card can support up to 84 T1 channels, each of which supports a service module T1 port. These channels can be divided between up to 11 card slots per bay.
- The maximum number of E1 channels is 63, each of which supports a service module E1 port. These channels can be divided between up to 8 card slots per bay.
- A standalone or redundant SRME or SRME/B SONET/SDH configuration can support up to 84 T1 channels or 63 E1 channels per bay, and these channels can be divided between all 12 card slots in the bay.

Planning for Advanced Software Features

Inverse Multiplexing over ATM (IMA) Configurations—MGX 8830, MGX 8850 (PXM45), and MGX 8850 (PXM1E)

The PXM1E-16-T1E1 and AXSM-32-T1E1-E cards support *inverse multiplexing over ATM* (IMA) into a single, higher-speed logical ATM port. The IMA feature enables multiple T1 or E1 lines to be grouped into a single high-speed ATM port.

Note The PXM1E-16-T1E1 card is used in MGX 8830 and MGX 8850 (PXM45) switches; the AXSM-32-T1E1-E card is used in MGX 8850 (PXM45) switches.

This feature does not apply to MGX 8950.

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The advantage of the IMA feature is that you do not need T3/E3 circuits to support high bandwidth on your switch. T1 IMA supports up to 16 1.544-Mbps links, and E1 IMA supports up to 16 2.048-Mbps links.

Here are some IMA characteristics:

- Is ATM Forum 1.0- and 1.1-compliant.
- Supports differential delays of up to 200 milliseconds (ms) across T1s and up to 250 ms across E1s in an IMA group.
- Configures each T1 or E1 interface as a single port running at full line rate when IMA is disabled.
- Any group of *n* x T1s or *n* x E1s can support an *n* x T1 or *n* x E1 port when IMA is enabled.
- When enabled, can have multiple IMA ports of any configuration supported per card. (A specific T1 or E1 line can be in only one T1/E1 or IMA port at a time.)

When a T1/E1 circuit fails, an IMA port automatically adjusts to continue operation over the remaining circuits. You can also configure the minimum number of T1/E1 links, which allows the IMA group to continue operating when individual T1/E1 link failures occur.

Note To configure switches for IMA, the only hardware requirement is that all lines in a group must be set up between the same two cards on a pair of switches. Beyond that, all IMA configuration is done in the software.

To configure the software for IMA or other configurations in this section, refer to the *Cisco MGX 8800/8900 Series Configuration Guide, Release 5.2* for details.

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CHAPTER 5

Installing the Cisco MGX Switch or Gateway

This chapter describes the following installation procedures:

- Installing the MGX 8850 (PXM1E/PXM45) Switch, MGX 8850/B or MGX 8880 Media Gateway, page 5-1
- Installing the MGX 8950 Switch, page 5-49
- Installing the MGX 8830 or MGX 8830/B Switch, page 5-98
- Installing the Ferrite Bead on the PXM-UI-S3/B Card, page 5-133
- First Time Power On Procedure for MGX Switches, page 5-137

Note The installation information in this chapter does not apply to the MGX 8850 (PXM1) switch. For manuals about PXM1-based systems, refer to "Documentation" section on page 37.

For these procedures, you need the same tools that you used previously. For your convenience, here is a reminder about the functions of the 3-in-1 tool (part 700-07569-01) that ships with your chassis. It has 3 heads:

- A flat head for unlatching front card ejectors and loosening and tightening the back card captive screws
- A hex head for unlatching the chassis door
- A Phillips head for loosening and tightening the back card captive screws

Installing the MGX 8850 (PXM1E/PXM45) Switch, MGX 8850/B or MGX 8880 Media Gateway

This section provides procedures for installing a MGX 8850 (PXM1E/PXM45) or MGX 8850/B (PXM1E/PXM45) switch, or an MGX 8880 Media Gateway in a rack or in a Cisco-supplied cabinet. The procedures are grouped in this section, because they are similar for all four chassis'.

Caution Due to the weight of the switch or gateway, it is recommended that a mechanical lift be used to install the switch or gateway in a rack.

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Warning **Only trained and qualified personnel should be allowed to install or replace this equipment.** Statement 49

Warning **This unit is intended for installation in restricted access areas. A restricted access area is where access can only be gained by service personnel through the use of a special tool, lock and key, or other means of security, and is controlled by the authority responsible for the location.** Statement 37

Caution Before you begin the installation procedures, read the entire section for important information and safety warnings.

Caution Before installing and cabling the equipment, be aware of standard safety practices and the hazards involved in working with electrical circuitry to prevent accidents. See the "Safety Requirements" section on page 3-2 for cautions and warnings that are necessary to ensure a safe and hazard-free installation.

To see translations of the warnings that appear in this publication, refer to the *Regulatory Compliance and Safety Information for Cisco Multiservice Switch Products (MGX, BPX, and SES)* that shipped with the chassis.

Installation Checklist

When you install a MGX 8850, MGX 8850/B, or MGX 8880 system, be sure that you follow the installation procedures in the proper sequence. Table 5-1 is a checklist of the installation steps in the order in which they should occur. Detailed installation instructions are located in the sections following Table 5-1.

The system is shipped in one of two hardware configurations:

- Open rack—Modules and cards are shipped preinstalled in the MGX 8850, MGX 8850/B, or MGX 8880 system and are tested according to customer specifications before they are shipped. The system is ready for installation in a customer-supplied open rack. The optional AC power supply tray, air intake plenum, upper and lower fan trays, and exhaust plenum are packaged separately and will need to be installed in the rack.

  If you are not using a mechanical lift, you will need to remove the modules and cards from the MGX system to lessen the weight of the chassis prior to installing it in the rack. Follow the installation procedures in the "Rack-Mounted System (Without Lift)" column of Table 5-1.

  If you are using a lift to mount the MGX 8850, MGX 8850/B, or MGX 8880 system in a rack, you do not need to remove the modules, cards, and hardware components. Follow the installation procedures in the "Rack-Mounted System (with Lift)" column of Table 5-1.

- Cisco cabinet—All components are shipped preinstalled in a Cisco cabinet. Follow the installation procedures in the "Cisco Cabinet System" column of Table 5-1.

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Note Using a lift to install a fully loaded MGX 8850, MGX 8850/B, or MGX 8880 system in a rack greatly simplifies the installation process, because the modules do not need to be removed from the chassis.

Before proceeding with the installation, verify that all of the ordered parts are present and in good condition. Store a record of the parts and serial numbers. If any parts are missing or damaged, contact your sales representative.

Caution Proper ESD protection is required whenever you handle Cisco equipment. Installation and maintenance personnel should be properly grounded through the use of grounding straps to eliminate the risk of ESD damage to the equipment. Modules are subject to ESD damage whenever they are removed from the chassis.

Table 5-1 Installation Checklist—MGX 8850, MGX 8850/B, or MGX 8880 Systems

Check	Steps	Rack-Mounted System (Without Lift)	Rack-Mounted System (with Lift)	Cisco Cabinet System
	Step 1	Install stability plate for seismic anchoring		
	Step 2	Ground the frame bonding ground connection for a Cisco-supplied rack		
	Step 3	Measure Rack Space		Connect the Fan tray power cables to the switch
	Step 4	Prepare for rack installation		Connect the AC power supply tray to the switch
	Step 5	Install the AC Power Supply Tray, as necessary • Remove the AC power supplies from the AC power supply tray • Install the AC Power Supply Tray(s) • Reinstall the AC Power Supplies		Connect the DC PEM to the switch
	Step 6	Install the Air Intake Plenum		Connect the Back Cards.
	Step 7	Install the Lower Fan Tray		Connect the Console Port.
	Step 8	Install the switch without a Mechanical Lift • Prepare for Installation • Remove the Front Cards • Remove the Back Cards • Remove the Back Cards from an APS Assembly • Install the Switch in the Rack • Reinstall the APS Assembly • Reinstall the Back Cards • Reinstall the Front Cards	Install the switch with a Mechanical Lift • Install the Switch in a 19-Inch or 23-Inch Rack • Install the Switch in a 19-Inch Cabinet	Connect Power to the switch • Connect AC Power to the Switch • Connect DC Power to the Switch
	Step 9	Install the Upper Fan Tray		Connect the External Clock (optional)

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Table 5-1 Installation Checklist—MGX 8850, MGX 8850/B, or MGX 8880 Systems (continued)

Check	Steps	Rack-Mounted System (Without Lift)	Rack-Mounted System (with Lift)	Cisco Cabinet System
	Step 10	Install the Exhaust Plenum		Connect the Alarms (optional)
	Step 11	Install the DC PEM(s) as necessary		Connect the MP Connection (optional)
	Step 12	Install the Cable Management Assembly		Connect the LAN1/2 Ports (optional)
	Step 13	Connect the Fan Tray Power Cables to the switch		Verify EMI Compliance
	Step 14	Connect the AC Power Supply Tray to the switch as necessary		
	Step 15	Connect the DC PEM to the switch		
	Step 16	Connect the Back Cards		
	Step 17	Connect the Console Port		
	Step 18	Connect Power to the switch • Connect AC Power to the Switch • Connect DC Power to the Switch		
	Step 19	Connect the External Clock (optional)		
	Step 20	Connect the Alarms (optional)		
	Step 21	Connect the MP Connection (optional)		
	Step 22	Connect the LAN1/2 Ports (optional)		
	Step 23	Verify EMI Compliance		

Note After completing these steps, proceed to the "First Time Power On Procedure for MGX Switches" section on page 5-137 if this is a first-time installation.

Installation Procedures

Warning **The switch should not receive power while you install components.**

The following sections describe how to install the MGX 8850, MGX 8850/B, and MGX 8880 systems.

Special Installation Notes for the MGX 8880 Media Gateway

Installing the MGX 8880 gateway varies from MGX 8850 installation in the following ways:

- The MGX 8880 DC version is 14 RUs. The AC version is 17 RUs. The new low profile cooling system makes the space savings possible. Refer to Table 3-24 and Table 3-25 when planning your MGX 8880 space needs.

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- The current MGX 8850 chassis use a 25-pin connector at the plenum end of the fan tray, but the MGX 8880 uses a 44-pin connection. The MGX 8880 cable is keyed to ensure it cannot be used on an MGX 8850 chassis.
- In the MGX 8880 chassis, color coded slot identification has been added for PXM45 cards and SRME/B cards. (Cards will have mating color coding—yellow for PXM45; blue for SRME/B.) See Figure 5-1.
- The MGX 8880 has a guide system for fan tray and power cable insertion.
- Alignment pins have been added to the MGX 8880 back plane to aid with replacing the new redundancy connector used with the VXSM cards (RCON part is RCON-1TO5-8850). The MGX 8880 comes from the factory with this RCON installed in the top right bay and bottom right bay, when viewed from the rear of the chassis.

Note The new fan tray for the MGX 8880 replaces two fan trays currently used to cool the MGX 8850 system. The new fan tray is hot swappable, and for convenience, has a pullout handle.

- The MGX 8880 power supply part numbers are:
  - MGX-PWR-AC-220 (AC power supply - 220 V)
  - MGX-PWR-DC (DC power supply with intake plenum)

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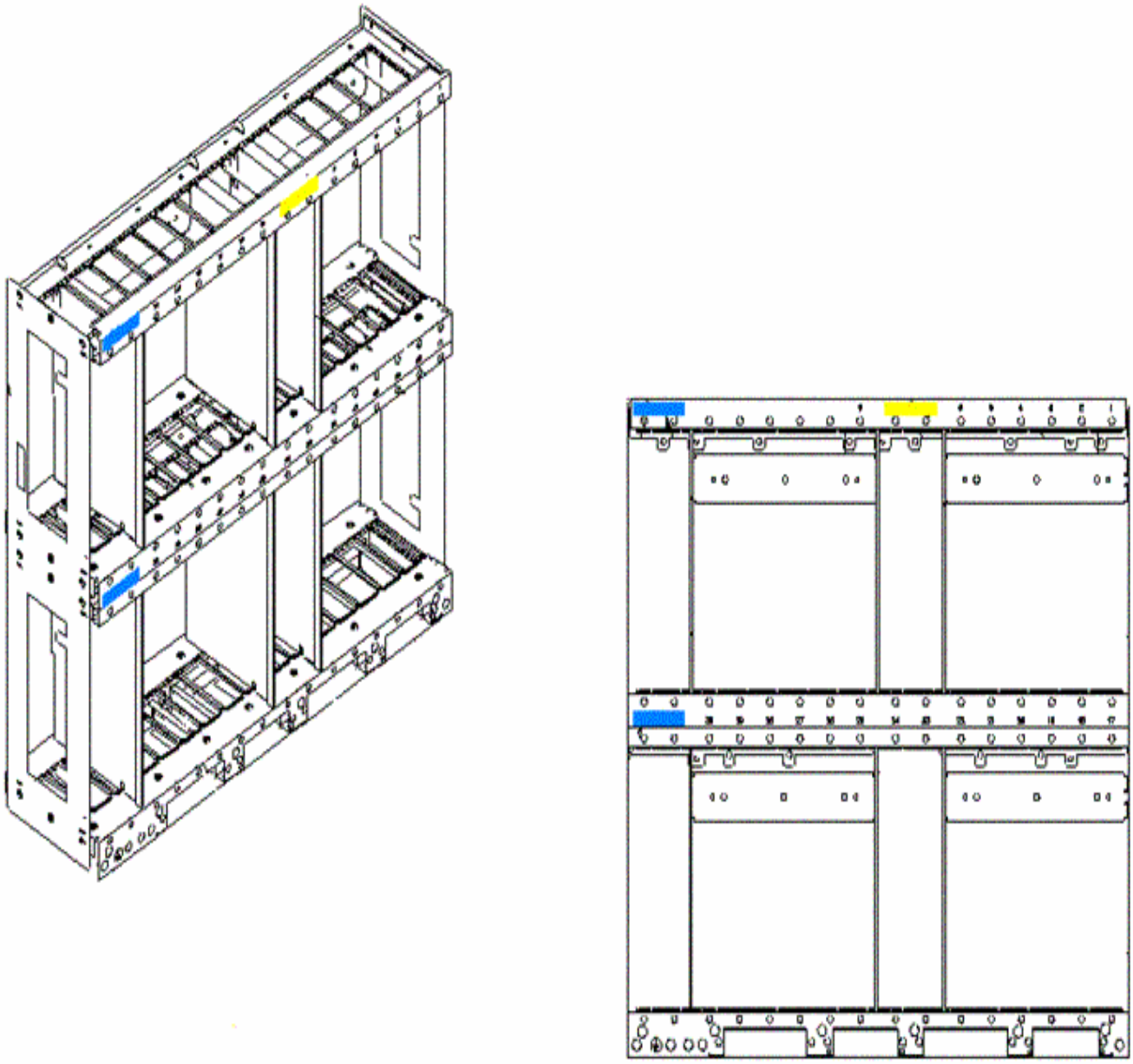
Figure 5-1 Color-Coded Slot Identification on the MGX 8880



MGX 8850 and MGX 8880 Installation

The installation procedures describe the following steps:

- Install Stability Plate for Seismic Anchoring, page 5-7
- Ground the Frame Bonding Ground Connection for a Cisco-Supplied Rack, page 5-10
- Measure Rack Space, page 5-12
- Prepare for Rack Installation, page 5-14
- Install the AC Power Supply Tray, page 5-17
- Install the Air Intake Plenum, page 5-20

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- Install the Lower Fan Tray, page 5-20(MGX 8850 only)
- Install the MGX 8850 or MGX 8850/B Switch without a Mechanical Lift, page 5-21
- Install the MGX 8850 or MGX 8850/B Switch with a Mechanical Lift, page 5-30
- Install the Upper Fan Tray, page 5-32 (MGX 8850 only)
- Install the Exhaust Plenum, page 5-32 (MGX 8880 has a combined exhaust plenum/fan tray)
- Install the DC PEM(s), page 5-33
- Install the Cable Management Assembly, page 5-34
- Connect the Fan Tray Power Cables to the Cisco MGX 8850 or MGX 8850/B Switch, page 5-35
- Connect the AC Power Supply Tray to the MGX 8850 or MGX 8850/B Switch, page 5-37
- Connect the DC PEM to the MGX 8850 or MGX 8850/B Switch, page 5-39
- Connect the Back Cards, page 5-41
- Connect the Console Port, page 5-42
- Connect Power to the MGX 8850 or MGX 8850/B Switch, page 5-43
- Connect the External Clock, page 5-46
- Connect the Alarms, page 5-46
- Connect the MP Connection, page 5-47
- Connect the LAN1/2 Ports, page 5-47
- Verify EMI Compliance, page 5-48

Install Stability Plate for Seismic Anchoring

You can anchor your Cisco-supplied rack or cabinet to the floor with an optional stability plate designed for seismic anchoring.

Note These instructions are specific to a Cisco-supplied cabinet, but can be used for anchoring a Cisco-supplied rack. If you are not installing your system in a Cisco-supplied rack or cabinet, anchor your third-party rack or vendor cabinet according to guidelines in the third-party vendor documentation.

The slots in the stability plate use up to 5/8-inch anchor bolts.

Caution When moving a Cisco-supplied cabinet, do not push the cabinet at its sides. Instead, grip the front or back edges of the cabinet.

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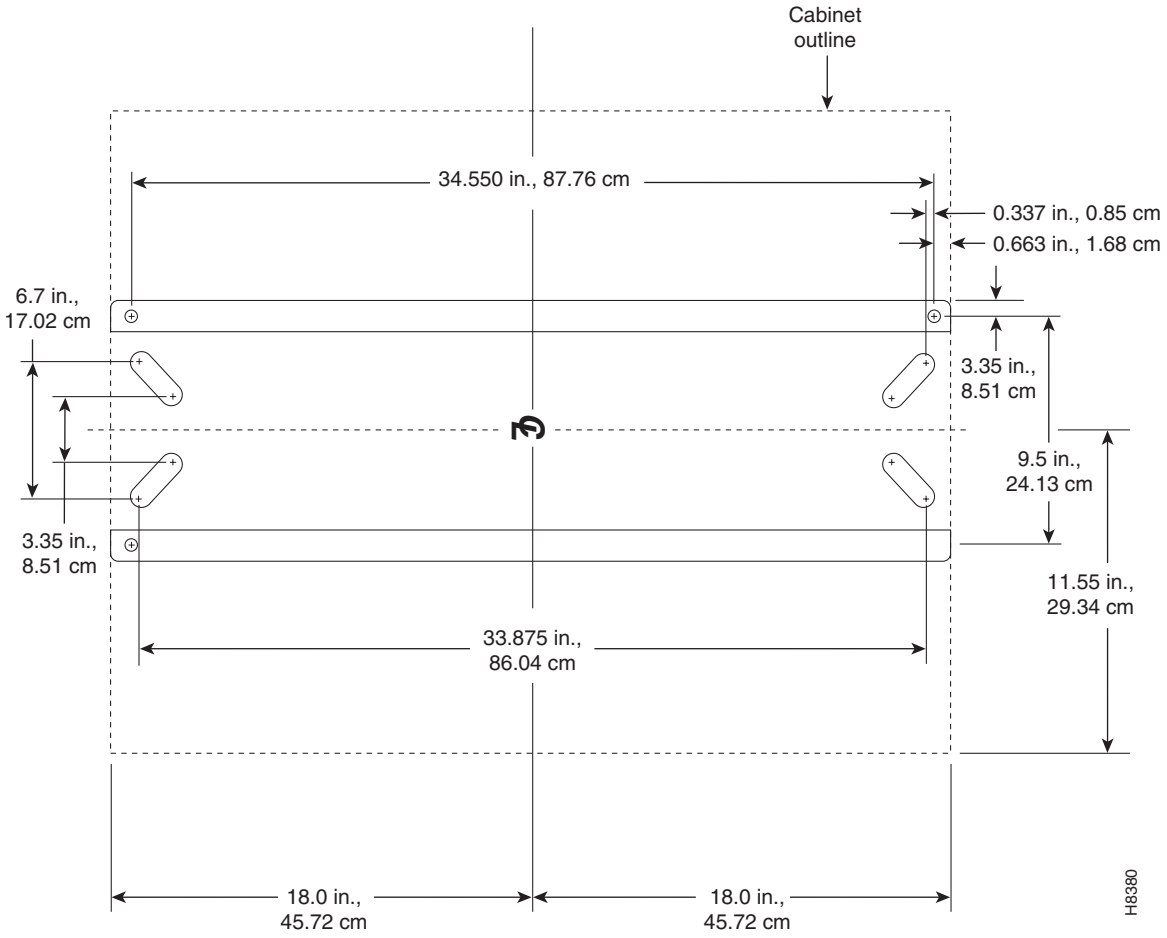
Complete the following steps to anchor your Cisco cabinet to a stability plate:

Step 1 Drill holes into the floor to install the stability plate. See Figure 5-2 for the dimensions.

Figure 5-2 Stability Plate Dimensions



Step 2 Use four 3/8 x 1 inch anchoring bolts (user-provided) to attach the stability plate to the floor.

Step 3 Roll the Cisco cabinet over the stability plate as shown in Figure 5-3.

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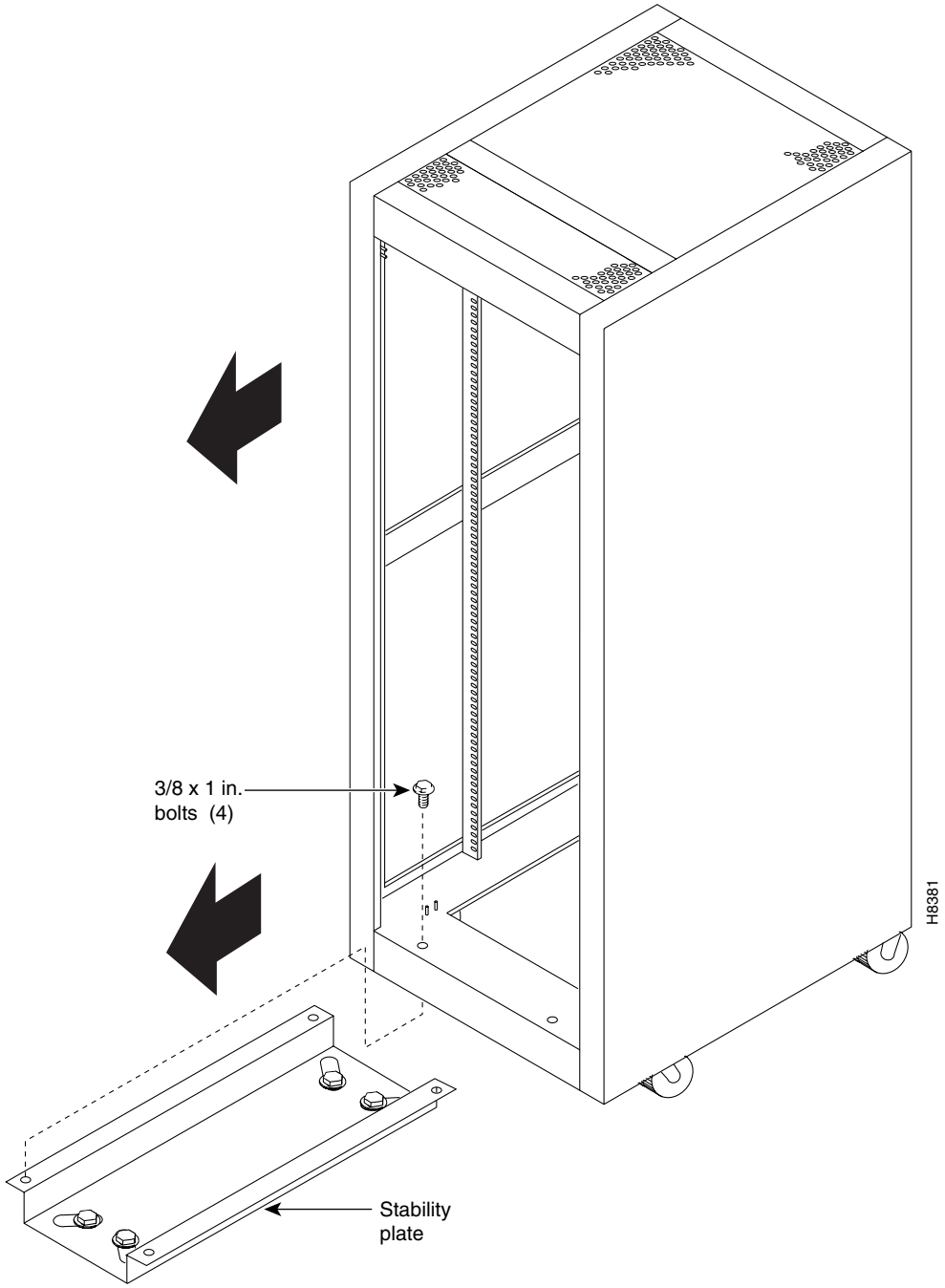
Figure 5-3 Installing a Cisco Cabinet over the Stability Plate



Step 4 Use four 3/8 x 1 inch anchoring bolts (user-provided) to secure the cabinet to the stability plate.

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Ground the Frame Bonding Ground Connection for a Cisco-Supplied Rack

A Cisco-supplied rack has two pairs of grounding studs located at the top and bottom of the rack. The rack comes with the hardware needed to secure a ground conductor to the grounding studs. The grounding studs measure 1/4 inch by 20 threads per inch. The grounding studs can accept a two-holed grounding connector designed to prevent rotation and possible loosening of the connector.

Note If you are installing your switch in a third-party vendor rack or cabinet, ensure that the rack and cabinet are properly grounded.

Caution The chassis ground wire must be the same size as the return conductor so that it can carry the entire battery load. See the "Wiring a Mixed Ground System with Redundant Supplies" section on page C-9 for more information.

Caution When moving a Cisco-supplied cabinet, do not push the cabinet at its sides. Instead, grip the front or back edges of the cabinet.

The ground conductor is typically connected to the building earth wiring, usually at a power distribution board. Complete the following steps to attach a ground conductor to the frame of a Cisco rack:

Step 1 Place the external, toothed star washers onto a stud. Figure 5-4 shows a Cisco cabinet with the frame bonding connection studs in the upper and lower parts of the cabinet. Only one of the studs is needed to make the connection. A ground symbol on the Cisco rack indicates the points of attachment.

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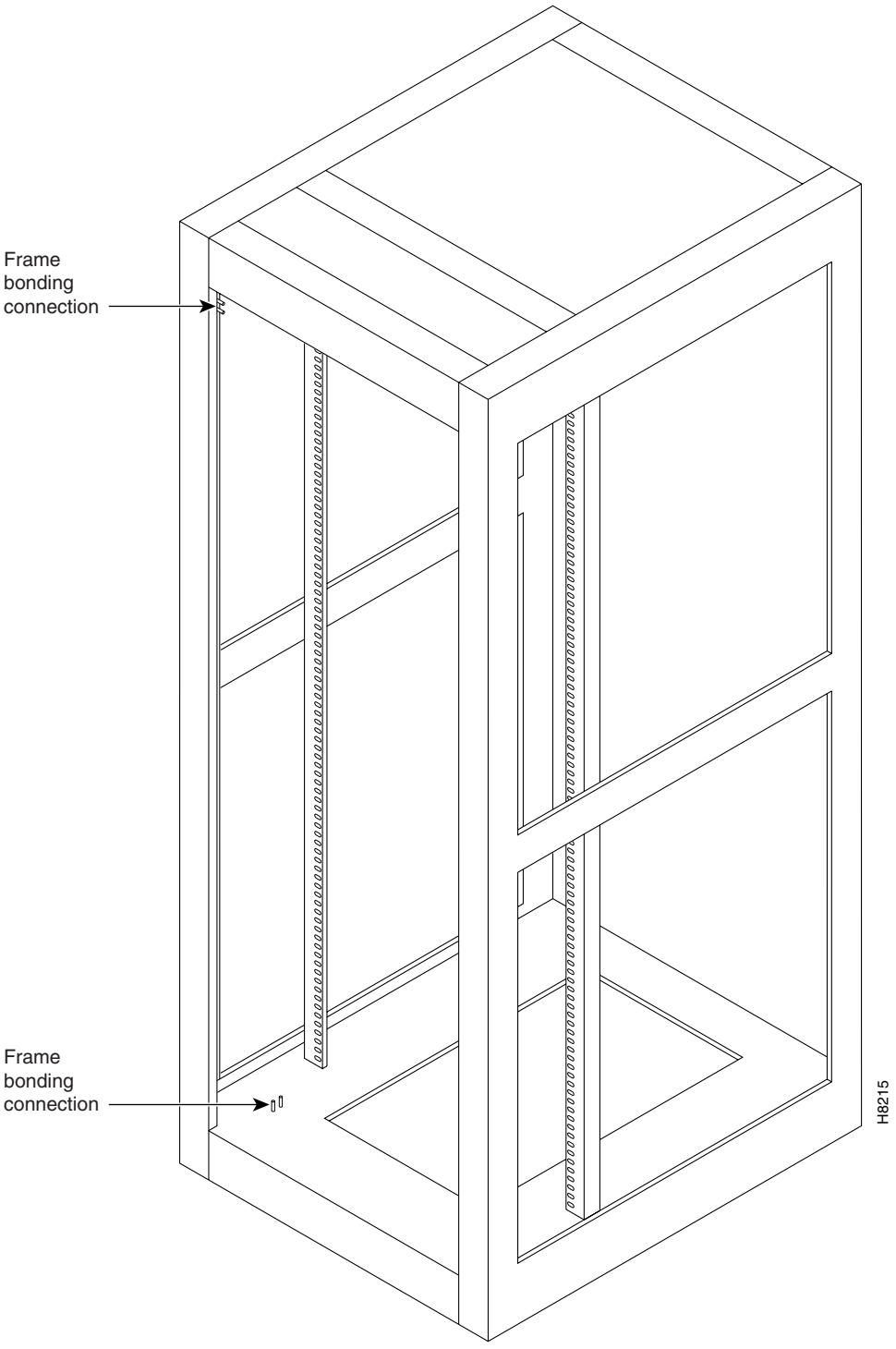
Figure 5-4 Frame Bonding Connection in Cisco-Supplied Rack



Step 2 Place the connector that terminates the grounding conductor closed-loop ring or two-hole compression fitting onto the studs.

Step 3 Place another external, toothed star washer or lock washer onto the studs.

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Step 4 Use a wrench to tighten a nut onto the threaded studs.

Measure Rack Space

Before you install the MGX 8850 switch and its related components, calculate the total rack space required to install your system.

- See Table 3-1 on page 3-11 for the MGX 8850 switch dimensions and rack units (RUs) required.
- See Table 3-24 on page 3-58 for the MGX 8880 DC gateway dimensions and rack units (RUs) and Table 3-25 on page 3-59 for the MGX 8880 AC gateway dimensions and rack units required.

System components must be installed in the rack in the following sequence, beginning at the bottom of the rack or cabinet (see Figure 5-5 for MGX 8850 and Figure 5-6 for MGX 8880):

1. AC power supply tray with power supply modules (optional)

Note On the MGX 8850, if a second AC power supply tray is used (optional), install it just above the first AC power supply tray and below the air intake plenum.

2. Air intake plenum
3. Lower fan tray (MGX 8850 or MGX 8850/B only)
4. MGX 8850, MGX 8850/B or MGX 8880 (with optional door)
5. Upper fan tray (MGX 8850 or MGX 8850/B only)
6. Exhaust plenum (combined exhaust plenum/fan tray on MGX 8880)

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Figure 5-5 Component Locations in a MGX 8850 or MGX 8850/B System

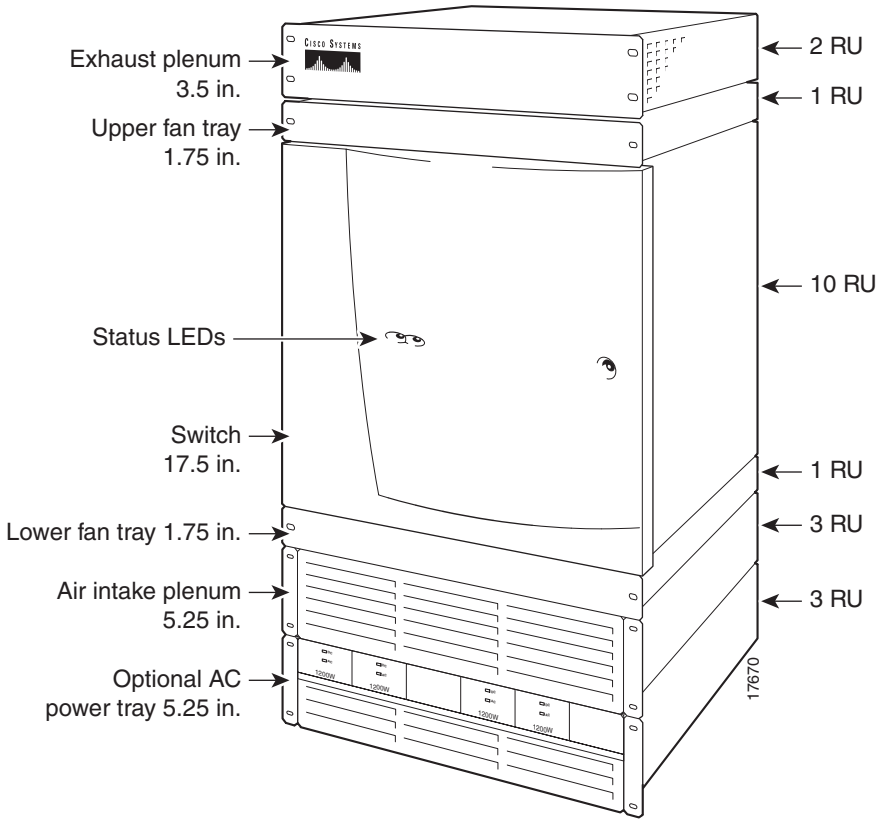

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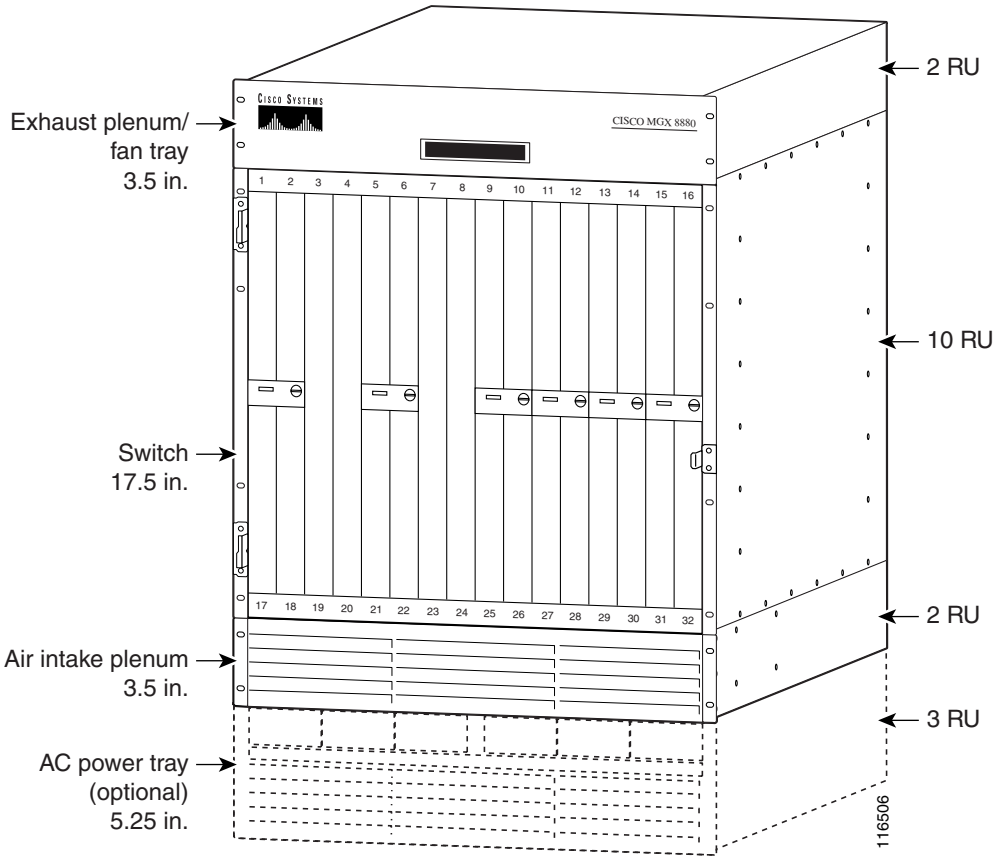
Figure 5-6 Component Locations in a MGX 8880 System



Note If you plan to expand your system to include more switches in the future, allow space in the rack for additions, keeping in mind the weight distribution and stability of the rack

Prepare for Rack Installation

The minimum distance between left and right mounting rails (as you face the rack) must be 17.75 inches or 45.08 cm. (Some 19-inch racks have only 17.50 inches between the rails.) The width of the components, such as the card cage and fan tray, is 17.72 inches.

When installing a MGX 8850, MGX 8850/B, or MGX 8880 system in a 19-inch rack, adhere to the following guidelines:

- Open-rack configuration—The switch and hardware components (optional AC power supply tray, air intake plenum, upper and lower fan trays, and exhaust plenum) need to be mid-mounted in the rack. Brackets for that purpose are included with the system.
- Cisco cabinet configuration—The switch and hardware components (optional AC power supply tray, air intake plenum, upper and lower fan trays, and exhaust plenum) are shipped front-mounted in the enclosure, and the rear of each component is supported by a rear bracket.

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When you are installing a MGX 8850, MGX 8850/B, or MGX 8880 system in a 23-inch rack, the switch and hardware components (which could include the optional AC power supply tray, air intake plenum, upper and lower fan trays, and exhaust plenum) need to be mid-mounted in the rack. You need special mounting brackets to mid-mount the components in a 23-inch rack (mounting kit, Cisco Part Number MGX-MNT23).

Figure 5-7 shows the mounting rail distances for front, middle, and rear mounting rails.

Figure 5-7 Mounting Rail Distances

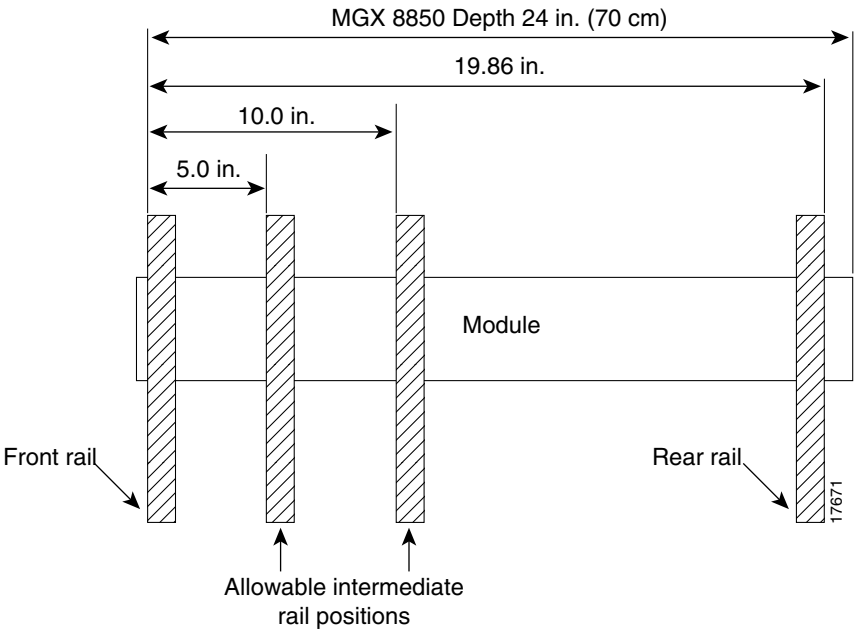

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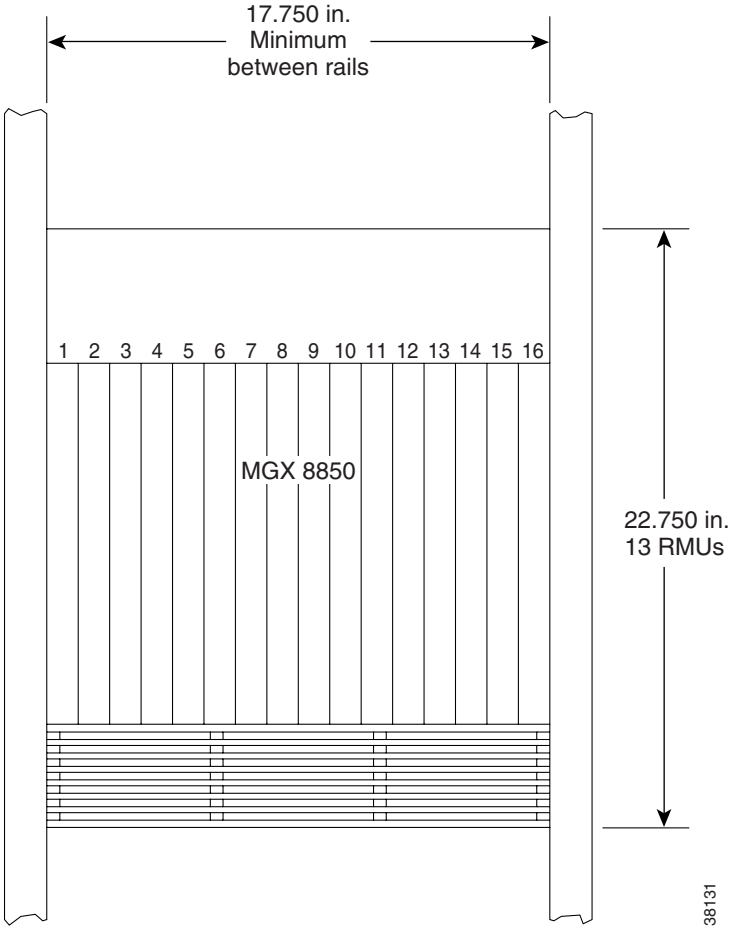
Figure 5-8 shows a front view of the mounting rails.

Figure 5-8 Rack Mounting Dimensions, Front View



Tip If a component requires more than two screws for installation in the rack or cabinet, install the two bottom screws first.

Caution Make sure that mounting the equipment does not create a hazardous condition due to uneven mechanical loading. The equipment rack should be securely supported.

Warning **To prevent bodily injury when mounting or servicing this unit in a rack, you must take special precautions to ensure that the system remains stable. The following guidelines are provided to ensure your safety:**

—This unit should be mounted at the bottom of the rack if it is the only unit in the rack.

—When mounting this unit in a partially filled rack, load the rack from the bottom to the top with the heaviest component at the bottom of the rack.

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—If the rack is provided with stabilizing devices, install the stabilizers before mounting or servicing the unit in the rack. Statement 1006

Install the AC Power Supply Tray

Note AC power supply trays are optional for the MGX 8850, MGX 8850/B, and MGX 8880 systems. If your system uses only DC power, proceed to the "Install the Air Intake Plenum" section on page 5-20.

Before installing the AC power supply tray, you should remove the power supplies from the tray. Removing the AC power supplies makes the AC power tray easier to install. For a mid-mount installation, you *must* remove the power supplies from the power supply tray before installing the tray.

This section contains the following procedures:

- Remove the AC Power Supplies from the AC Power Supply Tray, page 5-17
- Install the AC Power Supply Tray(s), page 5-18
- Reinstall the AC Power Supplies, page 5-19

Tip If a component requires more than two screws for installation in the rack or cabinet, install the two bottom screws first.

Tip Do not tighten the screws completely (use about one-half turn) until all components are mounted to the rack. Otherwise, the tolerances in the screw mounting holes can go against you and make it impossible to put the screws in a piece of equipment you install later. Once all the rack-mounted components are in, tighten all of the screws.

Warning **Before working on a system that has an On/Off switch, turn OFF the power and unplug the power cord.** Statement 1

Warning **Never install an AC power module and a DC power module in the same chassis.** Statement 264

Warning **Before working on a chassis or working near power supplies, unplug the power cord on AC units; disconnect the power at the circuit breaker on DC units.** Statement 12

Remove the AC Power Supplies from the AC Power Supply Tray

Complete the following steps to remove an AC power supply from the AC power supply tray:

Step 1 Place the AC power supply tray on a flat and stable surface (for example, a table top).

Step 2 Insert a small flat-blade (0.20 inch wide maximum) screwdriver in the access hole at the top of the air intake grille, as shown in Figure 5-9. Rotate the screwdriver in either direction until the latch opens.

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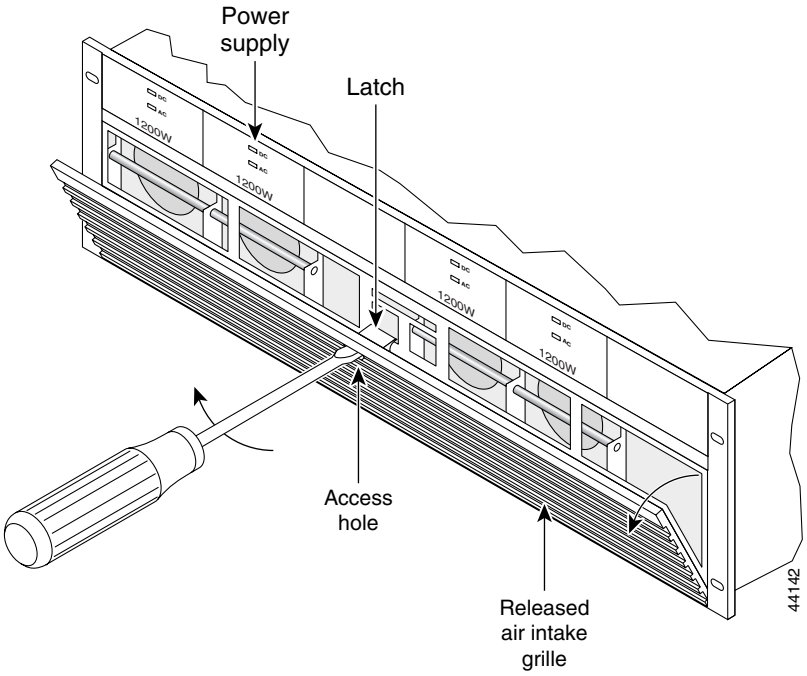
Figure 5-9 Removing an AC Power Supply



Step 3 Tilt the air intake grille down to about a 45-degree angle, lift it out, and set it aside. This exposes the hinged door that serves as the power supply retainer bracket.

Step 4 With a flat-blade screwdriver, unscrew the captive retainer screw in the center of the hinged door and tilt the door down.

Step 5 Loosen the captive screw at the bottom front of the AC power supply that you want to remove.

Step 6 Grip the handle and carefully remove the AC power supply by pulling it toward you.

Step 7 Repeat Step 5 and Step 6 for each AC power supply present in each AC power supply tray.

Install the AC Power Supply Tray(s)

Complete the following steps to install the AC power supply tray(s).

Note For optimum performance, it is recommended that you install dual AC power systems for full redundancy.

Step 1 Use mounting screws and a Phillips-head screwdriver to attach the mid-mounting brackets to the AC power supply tray if you are installing the system in a 19-inch or 23-inch rack. Insert each mounting screw from the inside of the AC power supply tray so that the nut is on the outside of the tray. A mounting kit is needed for a 23-inch rack (Cisco Part Number MGX-MNT23).

Note If you are installing the AC power supply tray in a 19-inch cabinet, it is front-mounted in the rack with support from rear brackets.

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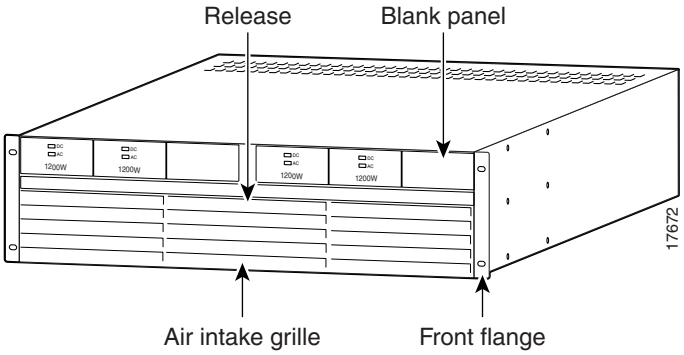
Step 2 Position the AC power supply tray, which occupies 3 RUs of space, at the bottom of the configuration or rack.

Step 3 Use four mounting screws and a Phillips-head screwdriver to bolt the AC power supply tray in the rack. See Figure 5-5 for the correct placement of the AC power supply tray.

Step 4 While you secure the front of the AC power supply tray with the front screw, hold the adjacent front flange of the tray slightly to the outside so that the hinged door can freely open and close. (See "Front flange" in Figure 5-10.) The space between the right-angle edge of the flange and the edge of the hinged door should be approximately 0.030 inch (about the thickness of a thumbnail).

Figure 5-10 AC Power Supply Tray—Front View



Step 5 If you are installing the AC power supply tray in a 19-inch cabinet, attach the rear-mounting brackets to the rack and use screws to secure the tray to the rear-mounting brackets.

Step 6 Repeat Step 1 through Step 5 to install a second AC power supply tray.

Reinstall the AC Power Supplies

Complete the following steps to reinstall power supplies that you have removed.

Caution Do not use a power screwdriver on captive screws.

Step 1 Slide each AC power supply into the AC power supply tray. You will encounter a slight resistance as you slide the AC power supply; apply even pressure to ensure full connector mating.

Step 2 Secure each AC power supply to the tray by tightening the captive screw at the front bottom of each AC power supply. For slots without a power supply, the hinged door on the tray should already have a removable blank panel.

Step 3 Rotate the hinged door and tighten the captive retainer screw in the center of the hinged door using a flat-blade screwdriver.

Step 4 Replace the air intake grille by putting the lower hooks over the hinged panel and then rotating the grille until it snaps into place.

Step 5 Repeat Step 1 through Step 4 to reinstall the AC power supplies in a second AC power supply tray. Refer to Table 1-5 to verify that you have the number of power supplies needed for your system.

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Install the Air Intake Plenum

Complete the following steps to install the air intake plenum.

Tip If a component requires more than two screws for installation in the rack or cabinet, install the two bottom screws first.

Step 1 If you are installing the system in a 19-inch or 23-inch rack, place the air intake plenum on a flat and stable surface (for example, a table top). Use mounting screws and a Phillips-head screwdriver to attach the mid-mounting brackets to the air intake plenum. You need a mounting kit to accommodate a 23-inch rack (Cisco Part Number MGX-MNT23).

Note If you are installing the air intake plenum in a 19-inch cabinet, it is front-mounted in the rack with support from rear brackets.

Step 2 Position the air intake plenum, which occupies 3 RUs of space, either at the bottom of the configuration or rack (for a DC-powered system) or directly above the AC power supply tray (for an AC-powered system).

Step 3 Use four mounting screws and a Phillips-head screwdriver to bolt the air intake plenum in the rack. See Figure 5-5 for the correct placement of the air intake plenum.

Step 4 If you are installing the air intake plenum in a 19-inch cabinet, attach the rear-mounting brackets to the rack and use screws to secure the air intake plenum to the rear-mounting brackets.

Install the Lower Fan Tray

Complete the following steps to install the lower fan tray in an MGX 8850 switch.

Note Skip this section if you are installing an MGX 8880 gateway.

Tip If a component requires more than two screws for installation in the rack or cabinet, install the two bottom screws first.

Step 1 If you are installing the system in a 19-inch or 23-inch rack, place the lower fan tray on a flat and stable surface (for example, a table top). Use mounting screws and a Phillips-head screwdriver to attach the mid-mounting brackets to the lower fan tray. You need a mounting kit to accommodate a 23-inch rack (Cisco Part Number MGX-MNT23).

Note If you are installing the fan tray in a 19-inch cabinet, it is front-mounted in the rack with support from rear brackets.

Step 2 Position the lower fan tray, which occupies 1 RU of space, directly above the air intake plenum.

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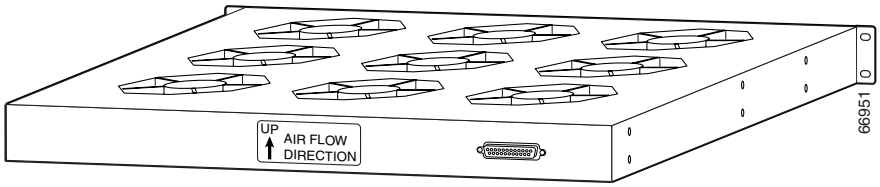
Ensure that the air flow direction arrow on the back of the lower fan tray is pointing up, as shown in Figure 5-11.

Figure 5-11 Lower Fan Tray Air Flow Direction



Step 3 Use four mounting screws and a Phillips-head screwdriver to bolt the lower fan tray in the rack. See Figure 5-5 for the correct placement of the lower fan tray.

Step 4 If you are installing the fan tray in a 19-inch cabinet, attach the rear-mounting brackets to the rack and use screws to secure the fan tray to the rear-mounting brackets.

Install the MGX 8850 or MGX 8850/B Switch without a Mechanical Lift

Caution Because of the risk of damage to the cards, modules, and backplane, it is strongly recommended that a mechanical lift be used. Using a lift greatly simplifies the installation and reduces the risk of damage. See "Install the MGX 8850 or MGX 8850/B Switch with a Mechanical Lift" section on page 5-30 for more information about installing the MGX 8850 or MGX 8850/B switch with a mechanical lift.

If a mechanical lift is not available for installation, the switch must be manually lifted into place. Since the switch is shipped with all components preinstalled, you must remove the cards and modules from the switch so that you can lift it into the rack.

The following sections contain instructions for installing a switch without the use of a mechanical lift:

- Prepare for Installation, page 5-22
- Remove the Front Cards, page 5-22
- Remove the Back Cards, page 5-23
- Remove the Back Cards from an APS Assembly, page 5-24
- Install the Switch in the Rack, page 5-24
- Install the Switch in a 19-Inch or 23-Inch Rack, page 5-25
- Install the Switch in a 19-Inch Cabinet, page 5-25
- Reinstall the APS Assembly, page 5-26
- Reinstall the Back Cards, page 5-27
- Reinstall the Front Cards, page 5-29

Tip If a component requires more than two screws for installation in the rack or cabinet, install the two bottom screws first.

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Prepare for Installation

Review the following guidelines before installation begins:

- Before removing any cards, modules, or assemblies, it is recommended that you carefully note and write down their location or slot number in the chassis.
- Verify that your ESD grounding wrist strap is properly connected. See the "Preventing ESD Damage" section on page 3-7 for detailed information about ESD procedures.

Remove the Front Cards

Complete the following steps to remove front cards from the chassis.

Note The card should slide in and out with only slight friction on the adjacent board's EMI gaskets. Do not force the card. Investigate any binding.

Each single-height front card has an extractor lever at the top of the faceplate to secure it in the card cage. Each double-height front card has an extractor lever at both the top and the bottom of the faceplate.

Caution Do not use a power screwdriver on captive screws.

Caution When extracting a front card, keep the card level until it is completely extracted from the chassis. Do not allow the front cards to drop against the cards below them. This could damage components on the cards.

Step 1 Connect a grounding strap to the ESD grounding jack or to the equipment rack.

Step 2 Place the switch on a flat and stable surface (for example, the floor).

Step 3 Open the front door of the switch, as necessary.

Step 4 Record the location of all of the cards before you remove them.

Step 5 Insert and press the flat-head tip of the 3-in-1 tool into the slot(s) of the extractor lever(s) at the top (and bottom) of the front card until the latch(es) springs open. Figure 5-12 shows the location of the lever slot in relation to the top of the front card.

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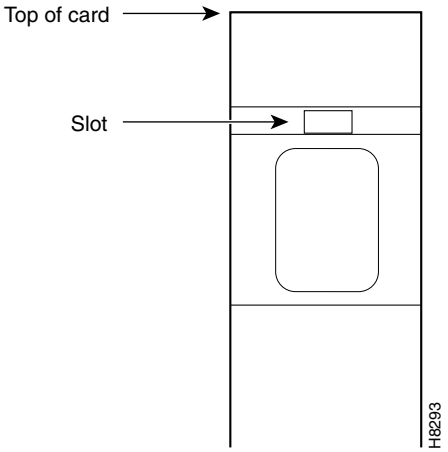
Figure 5-12 Front Card Extractor Lever



Step 6 Pull the extractor lever(s) to disconnect the front card from the midplane.

Step 7 Gently pull the front card out of the card cage. Keep the front card level and make sure that it does not hit the one beneath it.

Step 8 Place the front card in an antistatic bag or on an antistatic bench.

Step 9 Repeat Step 5 through Step 8 for each front card that you are removing from the chassis.

Remove the Back Cards

Complete the following steps to remove back cards from the chassis.

Caution Do not use a power screwdriver on captive screws.

Step 1 Record the location of all of the cards before you remove them.

Step 2 Use the flat-head or Phillips tip of the 3-in-1 tool to loosen the two captive screws located on the top and bottom of the back card faceplate.

Step 3 Pull each of the two extractor levers, located at the top and bottom of the faceplate, out to the horizontal position.

Step 4 Pull evenly on the two extractor levers to remove the back card from the card cage.

Step 5 Place the back card in an antistatic bag or on an antistatic bench.

Step 6 Repeat Step 2 through Step 5 for each back card that you are removing from the chassis.

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Remove the Back Cards from an APS Assembly

Complete the following steps to remove back cards from an APS assembly and to remove the APS connector from the switch.

Note An APS assembly consists of two back cards, a primary card and a secondary card, which are connected by an APS connector (Cisco Part Number MGX-8850-APS-CON or MGX-APS-CON).

Caution Do not use a power screwdriver on captive screws.

Caution A rocking motion during connector mating can bend or damage the APS connector pins.

In the next steps, you will remove one of the back cards connected to the APS assembly.

Step 1 Use the flat-head or Phillips tip of the 3-in-1 tool to loosen the two captive screws located on the top and bottom of the back card faceplate.

Step 2 Pull each of the two extractor levers, located at the top and bottom of the faceplate, out to the horizontal position.

Step 3 Pull evenly on the two extractor levers to remove the back card from the APS connector.

Step 4 Repeat through Step 3 for the remaining back card in the APS connector. The APS connector is still connected to the second back card when it is removed and comes out of the switch with the card.

Step 5 Carefully separate the second back card from the APS connector by pulling it out with a straight motion.

Step 6 Place the back cards and APS connector in antistatic bags or on an antistatic bench.

Step 7 Repeat through Step 6 for any remaining APS assemblies.

Install the Switch in the Rack

Caution Even with the cards removed, the weight and bulk of the card cage mandate that three or more people install it. Two installers can support and maneuver the switch while a third secures it to the rack.

This section details the procedures necessary for installing the MGX 8850 or MGX 8850/B switch with a mechanical lift in a 19-inch or 23-inch rack or a 19-inch cabinet.

- "Install the Switch in a 19-Inch or 23-Inch Rack" section on page 5-25
- "Install the Switch in a 19-Inch Cabinet" section on page 5-25

Tip If the screw holes on the card cage are not aligned with the holes on the frame, place a flat-blade screwdriver between the card cage and fan tray to raise the card cage. Insert the screws and tighten them. Remove the screwdriver from between the fan tray and card cage.

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Warning **Never attempt to lift the chassis with the handles on the power supplies, fan trays, or the switching modules. These handles are not designed to support the weight of the chassis. Using them to lift or support the chassis can result in severe damage to the equipment and serious bodily injury.** Statement 50

Warning **Two people are required to lift the chassis. Grasp the chassis underneath the lower edge and lift with both hands. To prevent injury, keep your back straight and lift with your legs, not your back. To prevent damage to the chassis and components, never attempt to lift the chassis with the handles on the power supplies or on the interface modules. These handles were not designed to support the weight of the chassis.** Statement 5

Install the Switch in a 19-Inch or 23-Inch Rack

Complete the following steps to install the switch in a 19-inch or 23-inch rack:

Step 1 Attach one mid-mounting bracket to each side of the Cisco MGX 8850 switch before installing the unit in a rack. You need a mounting kit to accommodate a 23-inch rack (Cisco Part Number MGX-MNT23).

Step 2 Have two people move the switch to the desired position in the rack, or, if spacers are used, slide the switch across the spacers and position it in the rack.

Note Maintain a gap of about 0.060 inch (1/16 inch) between units. Use a spacer if necessary.

Step 3 Use the 10-32 truss head screws to secure the switch to the mid-mounting rails.

Install the Switch in a 19-Inch Cabinet

Complete the following steps to install the switch in a 19-inch cabinet:

Step 1 Have two people move the switch to the desired position in the rack, or, if spacers are used, slide the switch across the spacers and position it in the rack.

Note The rear-mounting brackets cannot be installed before you put the unit in a 19-inch cabinet.

Maintain a gap of about 0.060 inch (1/16 inch) between units. Use a spacer if necessary.

Step 2 Use the 10-32 truss head screws to secure the switch to the front-mounting rails.

Step 3 Attach the rear-mounting brackets to the rack.

Step 4 Use the 10-32 truss head screws to secure the switch to the rear-mounting brackets.

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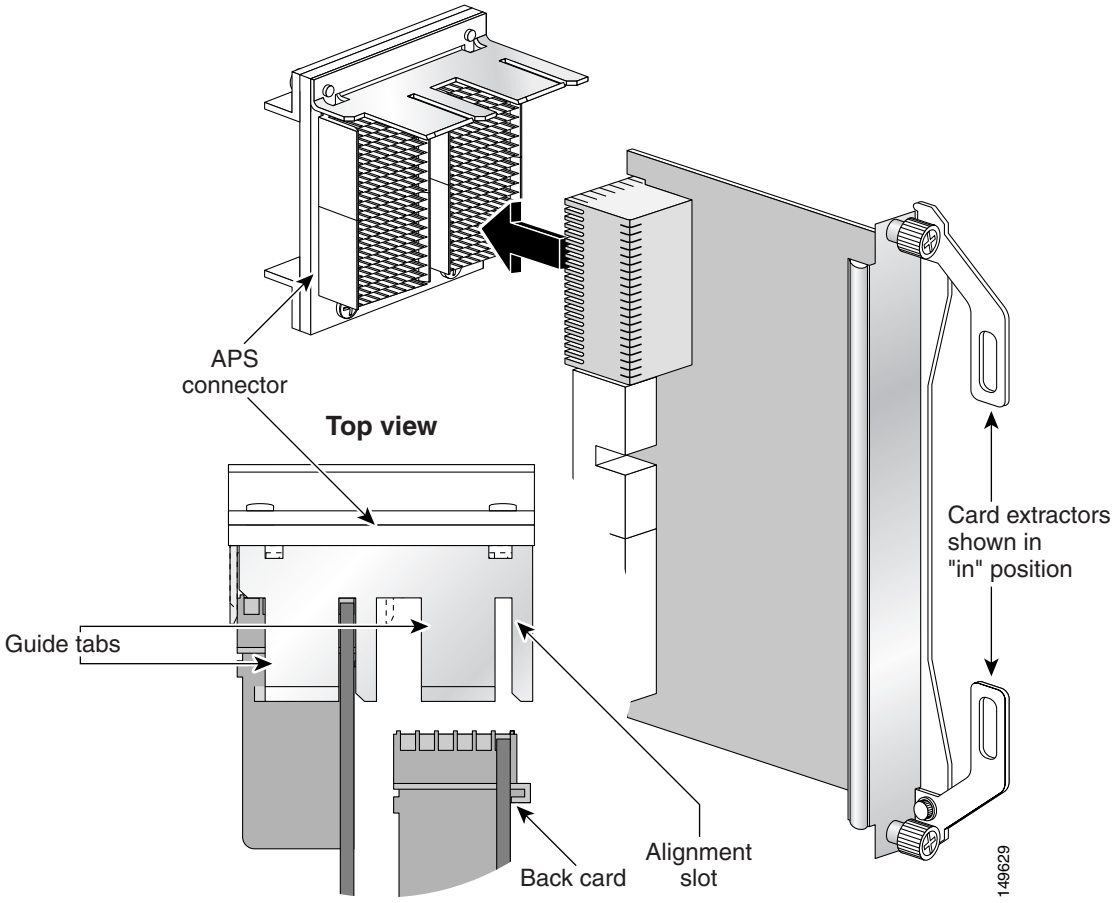
Reinstall the APS Assembly

Complete the following steps to reinstall the APS assembly.

Note If you are not installing an APS assembly, go to the "Reinstall the Back Cards" section on page 5-27.

Step 1 Place the edge of the back card in the alignment slot of the APS connector (see Table 1-6 for part numbers). Use the guide tabs on the APS connector to align the holes on the back card with the pins on the APS connector. (See Figure 5-13.)

Figure 5-13 Connecting the Back Card to the MGX-8850-APS-CON Connector



Step 2 Carefully install the back card in the APS connector by pushing firmly, with a straight motion, until the back card is securely connected

Caution A rocking motion during connector mating can bend or damage the APS connector pins.

Step 3 Repeat Step 1 and Step 2 to install a second back card in the APS connector. Figure 5-14 shows two back cards installed in the APS connector.

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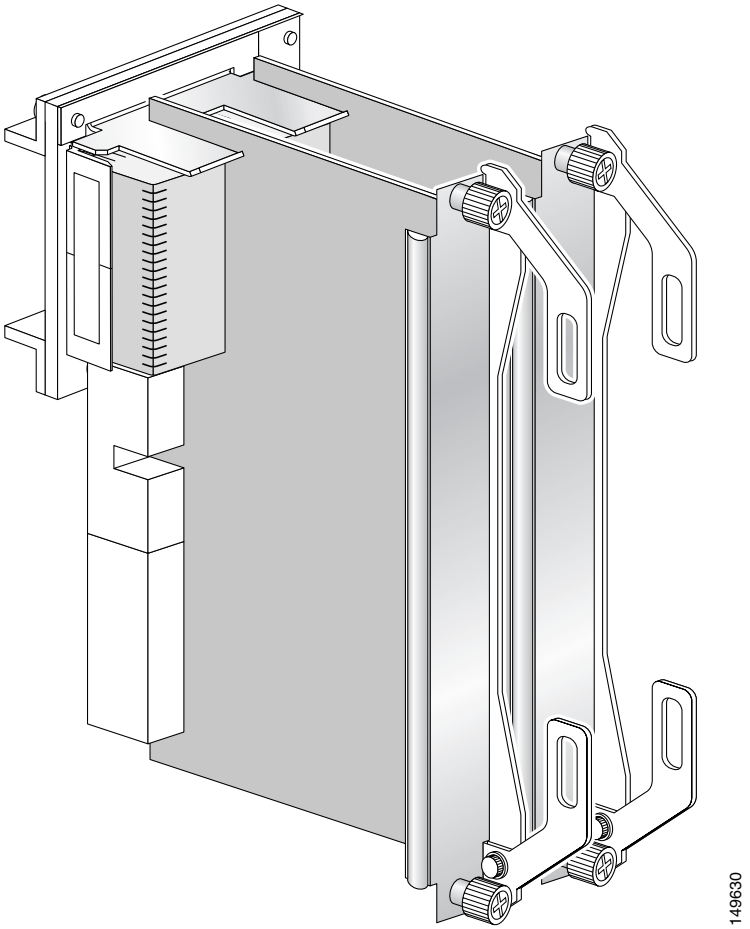
Figure 5-14 Two Back Cards in the MGX-8850-APS-CON Connector



Step 4 Position the APS assembly in the appropriate card slots.

Note The extractor levers must be closed (flush with the vertical edge of the back cards, as shown in Figure 5-13 and Figure 5-14), or the APS assembly cannot slide properly into the chassis.

Step 5 Slide the APS assembly all the way into the slot until it is properly seated in the backplane. The faceplates of the back cards are flush with the card cage when the APS assembly is properly seated.

Step 6 Tighten the captive screws on the back cards with the appropriate screwdriver. If you have difficulty inserting the captive screws, verify that the screws are aligned with the holes.

Reinstall the Back Cards

Note All cards must be fully seated in the chassis. When installing the back card, apply even pressure to the top and bottom of the faceplate to make sure that the card is fully seated.

The card should slide in and out with only slight friction on the adjacent board's EMI gaskets. Do not force the card. Investigate any binding.

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Caution To prevent damage to components on either side of a card, support the faceplate and keep the card level while sliding it into the chassis.

Caution Cards must be inserted in the correct slot positions. If service module back cards are installed in the wrong slots, electrical damage can occur. If a service module back card is inserted into a PXM back card slot, damage to the card and backplane can result. If the AXSM-1-2488 or AXSM-1-2488/B front cards are installed with incorrect back cards, damage to the cards might result.

Caution If you accidentally attempt to insert a service module back card into a PXM back card slot and then have difficulty operating the chassis, examine the backplane pins and back card connector to see if they have been bent or damaged.

Caution Do not use a power screwdriver on captive screws.

Warning **Blank faceplates and cover panels serve three important functions: they prevent exposure to hazardous voltages and currents inside the chassis; they contain electromagnetic interference (EMI) that might disrupt other equipment; and they direct the flow of cooling air through the chassis. Do not operate the system unless all cards, faceplates, front covers, and rear covers are in place.** Statement 1029

Complete the following steps to reinstall a back card in the switch:

Step 1 Refer to the notes you made when you recorded the location of each card to ensure that the cards are installed in the correct slots. For slot assignments for your system, refer to Table 1-3 and:

- Figure 1-5 and Figure 1-6 for the MGX 8850 (PXM1E)
- Figure 1-7 and Figure 1-8 for the MGX 8850 (PXM45)
- Figure 1-43 and Figure 1-44 for the MGX 8880.

Step 2 See the "General Card Installation Guidelines" section on page 3-8 to verify that there are no bent pins, bent dividers, or damaged connectors on the back cards.

Step 3 Verify that the two extractor levers on the back card are in the latched position (parallel with the faceplate).

Step 4 Position the back card over the appropriate slot guides and align the back card edge with the slot guides (top and bottom) in the chassis.

Step 5 Gently apply even pressure to the top and bottom of the faceplate while pushing the back card into the slot.

Step 6 Once the back card is installed in the chassis, apply even pressure to the top and bottom of the faceplate to fully seat the back card.

Step 7 Use the flat-head or Phillips tip of the 3-in-1 tool to tighten the two captive screws on the back card faceplate.

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Note Tighten the top and bottom captive screws in increments to prevent misalignment of the card. Do not overtighten the screws, but tighten them enough to secure the card.

Step 8 Repeat Step 2 through Step 7 for each back card that you are reinstalling in the chassis.

Step 9 Install blank faceplates over any empty slots.

Reinstall the Front Cards

Note All cards must be fully seated in the chassis. When installing the front card, apply even pressure to the top and bottom of the faceplate to make sure that the card is fully seated.

The card should slide in and out with only slight friction on the adjacent board's EMI gaskets. Do not force the card. Investigate any binding.

Each single-height front card has an extractor lever at the top of the faceplate to secure it in the card cage. Each double-height front card has an extractor lever at both the top and the bottom of the faceplate.

Caution If the AXSM-1-2488 or AXSM-1-2488/B front cards are installed with incorrect back cards, damage to the cards might result.

Caution To prevent damage to components on the bottom side of a card, support the faceplate and keep the card level while sliding it into the chassis.

Warning **Blank faceplates and cover panels serve three important functions: they prevent exposure to hazardous voltages and currents inside the chassis; they contain electromagnetic interference (EMI) that might disrupt other equipment; and they direct the flow of cooling air through the chassis. Do not operate the system unless all cards, faceplates, front covers, and rear covers are in place.** Statement 1029

Complete the following steps to reinstall a front card in the switch:

Step 1 Refer to the notes you made when you recorded the location of each card to ensure that the cards are installed in the correct slots. For slot assignments for your system, refer to Table 1-3 and:

- Figure 1-5 and Figure 1-6 for the MGX 8850 (PXM1E)
- Figure 1-7 and Figure 1-8 for the MGX 8850 (PXM45)
- Figure 1-43and Figure 1-44 for the MGX 8880.

Step 2 See the "General Card Installation Guidelines" section on page 3-8 to verify that there are no bent pins, bent dividers, or damaged connectors on the back cards.

Step 3 Verify that the extractor lever(s) are in the unlatched position.

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Step 4 Position the front card over the appropriate slot and align the front card edge with the slot guides (top and bottom) in the chassis.

Step 5 Lift up and out on the extractor lever(s) and gently apply pressure to the faceplate while pushing the front card into the slot.

Step 6 Once the front card is installed in the chassis, apply even pressure to the top and bottom of the faceplate to fully seat the front card.

Step 7 Press down on the extractor lever(s) until they latch to secure the front card.

Note Some cards have an "insertion delay latch" that needs to be raised before closing the extractor lever.

Step 8 Repeat Step 2 through Step 7 for each front card that you are reinstalling in the chassis.

Step 9 Install blank faceplates in any empty slot, as necessary.

Step 10 Close the front door on the switch, as necessary.

Install the MGX 8850 or MGX 8850/B Switch with a Mechanical Lift

Note If you installed the switch using instructions in the previous section, proceed to the "Install the Upper Fan Tray" section on page 5-32.

The switch is shipped with all of the ordered cards and modules installed and tested at the factory.

It is recommended that you install the switch using a mechanical lift. This switch can be installed easily by a single person if a mechanical lift is used. If a mechanical lift is not available, the cards and modules must be removed so that the switch can be lifted into the rack.

If you are not installing the switch using a mechanical lift, go to the "Install the MGX 8850 or MGX 8850/B Switch without a Mechanical Lift" section on page 5-21.

When using a mechanical lift, keep the following guidelines in mind:

- The lift should be capable of handling 300 lb.
- The T & S Hefti-Lift, Model HYD-5 is a good example of the type of lift you should use. For specifications, see http://www.tseq.com/products/ergosol/hefti-lift.htm.
- Minimum platform dimensions are 17.5 inches wide by 24 inches deep.

This section details the procedures you should use to install the switch with a mechanical lift in a 19-inch or 23-inch rack or a 19-inch cabinet.

- "Install the Switch in a 19-Inch or 23-Inch Rack" section on page 5-31
- "Install the Switch in a 19-Inch Cabinet" section on page 5-31

Tip If the screw holes on the card cage are not aligned with the holes on the frame, place a flat-blade screwdriver between the card cage and fan tray to raise the card cage. Insert the screws and tighten them, and then remove the screwdriver from between the fan tray and card cage.

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Tip If a component requires more than two screws for installation in the rack or cabinet, install the two bottom screws first.

Warning **Never attempt to lift the chassis with the handles on the power supplies, fan trays, or the switching modules. These handles are not designed to support the weight of the chassis. Using them to lift or support the chassis can result in severe damage to the equipment and serious bodily injury.** Statement 50

Install the Switch in a 19-Inch or 23-Inch Rack

Complete the following steps to install the switch in a 19-inch or 23-inch rack:

Step 1 Attach one mid-mounting bracket to each side of the Cisco MGX 8850 switch before installing the unit in a rack. You need a mounting kit to accommodate a 23-inch rack (Cisco Part Number MGX-MNT23).

Step 2 Use a lift to raise the switch to the desired position.

Step 3 Place two spacers (about 0.060 inch [1/16 inch] thick by about 2 inches by 30 inches, fabricated from HDPE, aluminium or cardboard). One spacer should be on the left edge and one on the right edge of the switch.

Step 4 Slide the switch across the spacers and position it in the rack.

Step 5 Use the 10-32 truss head screws to secure the switch to the mid-mounting rails.

Install the Switch in a 19-Inch Cabinet

Complete the following steps to install the switch in a 19-inch cabinet:

Step 1 Use a lift to raise the switch to the desired position.

Note The rear-mounting brackets cannot be installed before putting a unit in a 19-inch cabinet.

Step 2 Place two spacers (about 0.060 inch [1/16 inch] thick by about 2 inches by 30 inches, fabricated from HDPE, aluminium or cardboard). One spacer should be on the left edge and one on the right edge of the switch.

Step 3 Slide the switch across the spacers and position it in the rack.

Step 4 Use the 10-32 truss head screws to secure the switch to the front-mounting rails.

Step 5 Attach the rear-mounting brackets to the rack.

Step 6 Use the 10-32 truss head screws to secure the switch to the rear-mounting brackets.

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Install the Upper Fan Tray

Complete the following steps to install the upper fan tray.

Note Skip this step if you are installing an MGX 8880.

Tip If a component requires more than two screws for installation in the rack or cabinet, install the two bottom screws first.

Step 1 If you are installing the system in a 19-inch or 23-inch rack, place the upper fan tray on a flat and stable surface (for example, a table top). Use mounting screws and a Phillips-head screwdriver to attach the mid-mounting brackets to the upper fan tray. You need a mounting kit to accommodate a 23-inch rack (Cisco Part Number MGX-MNT23).

Note If you are installing the fan tray in a 19-inch cabinet, it is front-mounted in the rack with support from rear brackets.

Step 2 Position the upper fan tray, which occupies 1 RU of space, directly above the switch.

Ensure that the air flow direction arrow on the back of the upper fan tray is pointing up.

Step 3 Use four mounting screws and a Phillips-head screwdriver to bolt the upper fan tray in the rack. See Figure 5-5 for the correct placement of the upper fan tray. Verify that the base at the back aligns with the top-rear edge of the card cage.

Step 4 If you are installing the fan tray in a 19-inch cabinet, attach the rear-mounting brackets to the rack, and use screws to secure the fan tray to the rear-mounting brackets.

Install the Exhaust Plenum

Complete the following steps to install the exhaust plenum.

Note On and MGX 8880, the exhaust plenum and fan tray are combined.

Tip If a component requires more than two screws for installation in the rack or cabinet, install the two bottom screws first.

Step 1 If you are installing the system in a 19-inch or 23-inch rack, place the exhaust plenum on a flat and stable surface (for example, a table top). Use mounting screws and a Phillips-head screwdriver to attach the mid-mounting brackets to the exhaust plenum. You need a mounting kit to accommodate a 23-inch rack (Cisco Part Number MGX-MNT23).

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Note If you are installing the exhaust plenum in a 19-inch cabinet, it is front-mounted in the rack with support from rear brackets.

Step 2 Position the exhaust, which occupies 3 RUs of space, directly above the upper fan tray.

Step 3 Use four mounting screws and a Phillips-head screwdriver to bolt the exhaust plenum in the rack. See Figure 5-5 for the correct placement of the exhaust plenum.

Step 4 If you are installing the exhaust plenum in a 19-inch cabinet, attach the rear-mounting brackets to the rack, and use screws to secure the fan tray to the rear-mounting brackets.

Install the DC PEM(s)

Warning **Before performing any of the following procedures, ensure that power is removed from the DC circuits. To ensure that all power is removed, locate the circuit breakers or fuses on the DC power lines that service the DC circuits. Turn OFF the DC power line circuit breakers and remove the DC power line fuses.** Statement 322

Warning **Before working on a system that has an On/Off switch, turn OFF the power and unplug the power cord.** Statement 1

Warning **Never install an AC power module and a DC power module in the same chassis.** Statement 264

Warning **Before working on a chassis or working near power supplies, unplug the power cord on AC units; disconnect the power at the circuit breaker on DC units.** Statement 12

For a DC-powered system, install the DC PEMs at the back of the air intake plenum. Tighten the captive screws to attach the DC PEM to the component.

If you install only one DC PEM, install it on the right, as viewed from the rear of the air intake plenum. (See Figure 5-15 for MGX 8850 and Figure 5-16 for MGX 8880.)

Figure 5-15 DC PEMs Installed Behind the Air Intake Plenum on MGX 8850

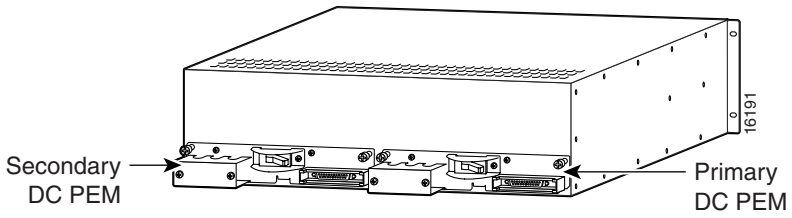

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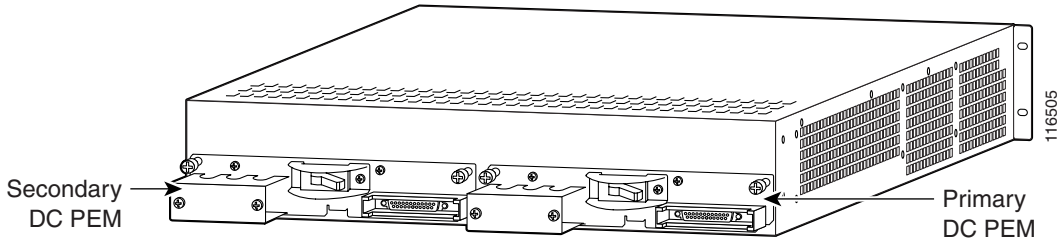
Figure 5-16 DC PEMs Installed Behind the Air Intake Plenum on MGX 8880



Install the Cable Management Assembly

The cable management assembly consists of two identical, horizontal cable managers, two mounting brackets, and screws. Complete the following steps to install the cable management assembly:

Step 1 Use the provided No. 10-32 screws and the appropriate screwdriver to attach the two mounting brackets to the right and left sides of the rear of the air intake and exhaust plenums.

Step 2 Use the provided No. 10-32 screws and the appropriate screwdriver to install the cable managers on the mounting brackets. The cable guides on the upper cable manager must be on the bottom. The cable guides on the lower cable manager must be on the top. See Figure 5-17 for an MGX 8850 system and Figure 5-18 for an MGX 8880 system.

Figure 5-17 Cable Management Assembly at Back of an MGX 8850 System

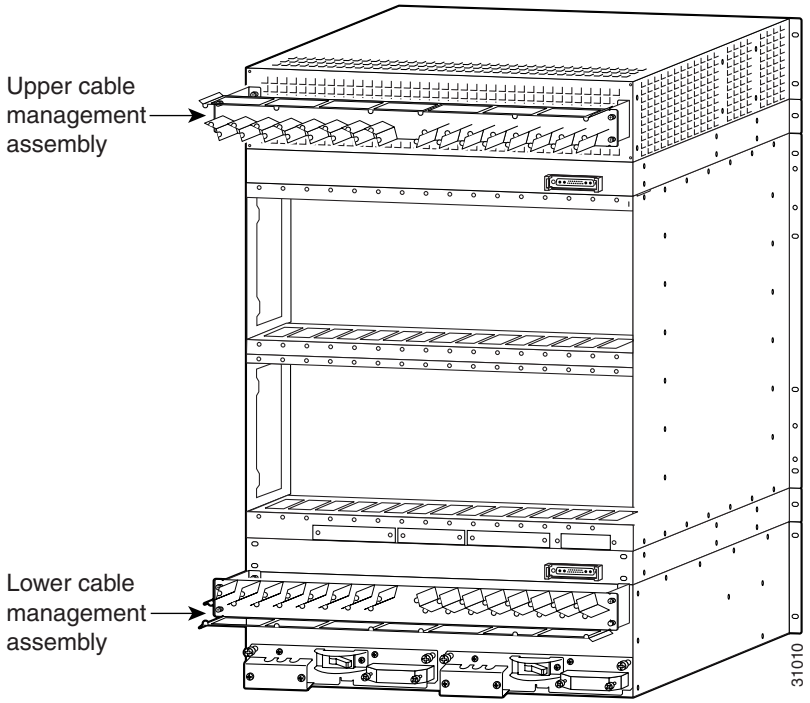


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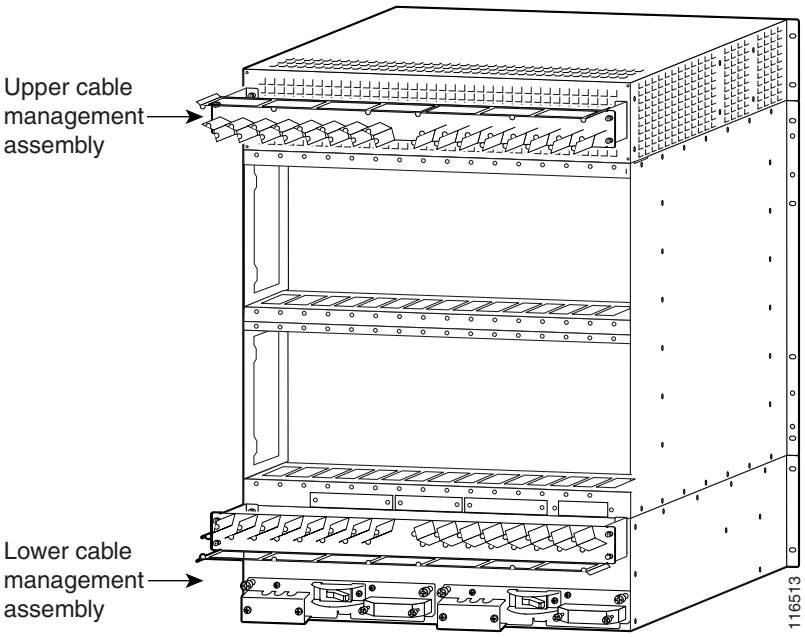
Figure 5-18 Cable Management Assembly at Back of an MGX 8880 System



Note On an MGX 8880, you might find that some cables do not fit into the cable management system. If the cables are too thick (for example, the T1E1 cards have thick cables), remove the fins, which are attached with two small Phillips-head screws.

Connect the Fan Tray Power Cables to the Cisco MGX 8850 or MGX 8850/B Switch

The fan trays receive power from the backplane through fan tray power cables. To reach the backplane D-connector, the fan power cable D-connector passes through an opening at the bottom rear of the card cage. There are four openings for cabling: two for system power and two for fan tray power. From left to right, the sequence of the access openings in the card cage is as follows:

1. System power (source A)
2. Fan tray power (lower fan tray)
3. System power (source B)
4. Fan tray power (upper fan tray)

Caution Do not use a power screwdriver on captive screws.

Complete the following steps to connect the fan tray power cables to the switch:

Step 1 Notice that the smaller side of the backplane D-connector faces down, and position the smaller side of the cable D-connector so that it also faces down. Figure 5-19 shows the connectors for the fan tray power cable.

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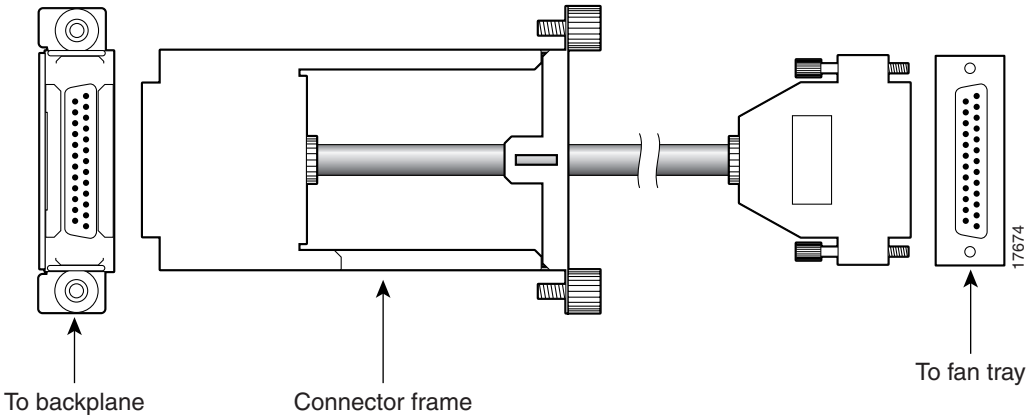
Figure 5-19 Fan Tray Power Cable



Step 2 Use both hands to slip the connector frame through the second (lower fan tray) or fourth (upper fan tray) access opening at the bottom rear of the card cage. Move the connector straight toward the backplane so that you can guide it through the opening. Be sure that the D-connector is fully inserted in the backplane connector and that the captive screws on the connector frame are clearly aligned with the threaded holes on the chassis.

Step 3 Tighten the captive screws enough to secure the connector frame flush to the chassis. Do not overtighten the screws or use a power screwdriver.

Step 4 Plug the D-connector at the other end of the cable into the connector on the back of the lower or upper fan tray and tighten the captive screws enough to secure the connector. Do not overtighten the screws or use a power screwdriver. Figure 5-20 shows the fan tray power cabling.

Note The bottom of the illustration in Figure 5-20 shows the back of an AC power supply tray. The presence of the AC power supply tray will not affect the fan tray power cabling. The fan tray power cabling is the same for an AC- or DC-powered system.

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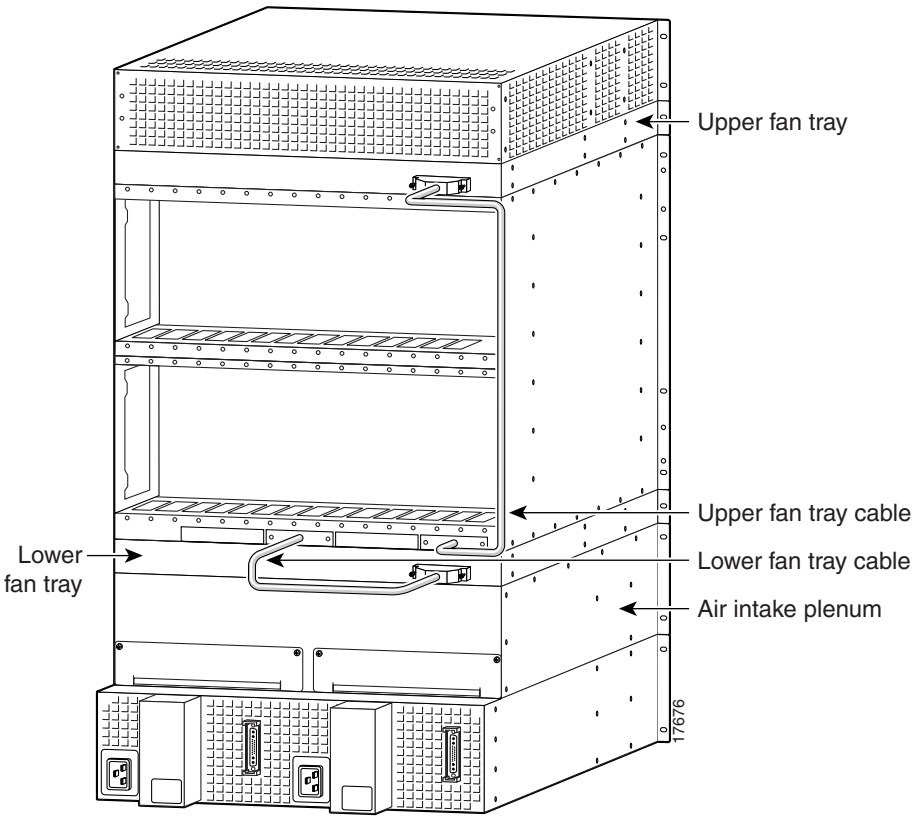
Figure 5-20 Fan Tray Power Cabling



Step 5 Repeat Step 1 through Step 4 with the other fan tray power cable to connect the other fan tray.

Connect the AC Power Supply Tray to the MGX 8850 or MGX 8850/B Switch

Caution Do not use a power screwdriver on captive screws.

If you are using AC power, complete the following steps to connect the AC power supply tray to the switch. If you are using DC power, proceed to the "Connect the DC PEM to the MGX 8850 or MGX 8850/B Switch" section on page 5-39.

Step 1 Notice that the smaller side of the backplane D-connector faces down, and position the smaller side of the cable D-connector so that it also faces down. Figure 5-21 shows the connectors for the AC power supply tray cable.

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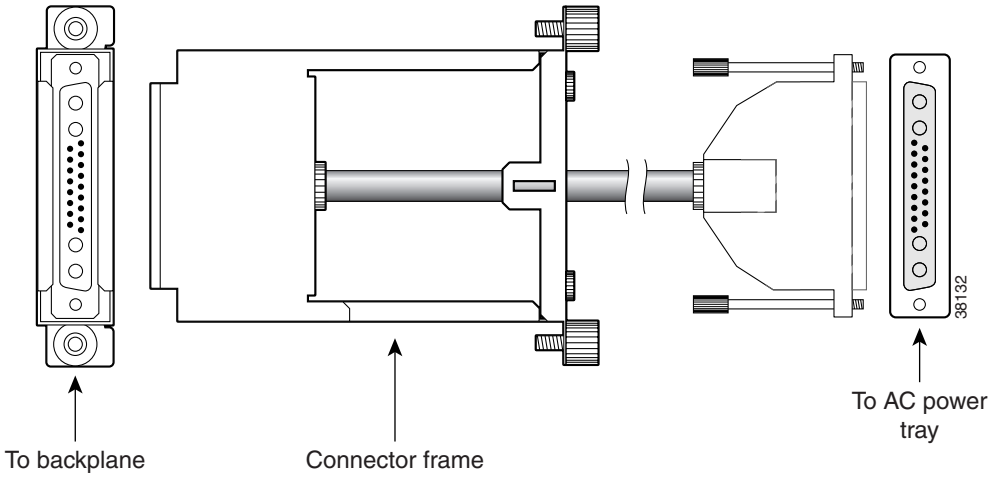
Figure 5-21 AC Power Supply Tray Cable



Step 2 Use both hands to slip the connector frame through the first (source A) or third (source B) access opening at the bottom rear of the card cage. Move the connector straight toward the backplane so that you can guide it through the opening. Be sure that the D-connector is fully inserted in the backplane connector and that the captive screws on the connector frame are clearly aligned with the threaded holes on the chassis.

Step 3 Tighten the captive screws enough to secure the connector frame flush to the chassis. Do not overtighten the screws or use a power screwdriver.

Step 4 Plug the D-connector at the other end of the cable into the first or second connector on the back of the AC power supply tray and tighten the captive screws enough to secure the connector. Do not overtighten the screws or use a power screwdriver. Figure 5-22 shows the AC power supply tray power cabling.

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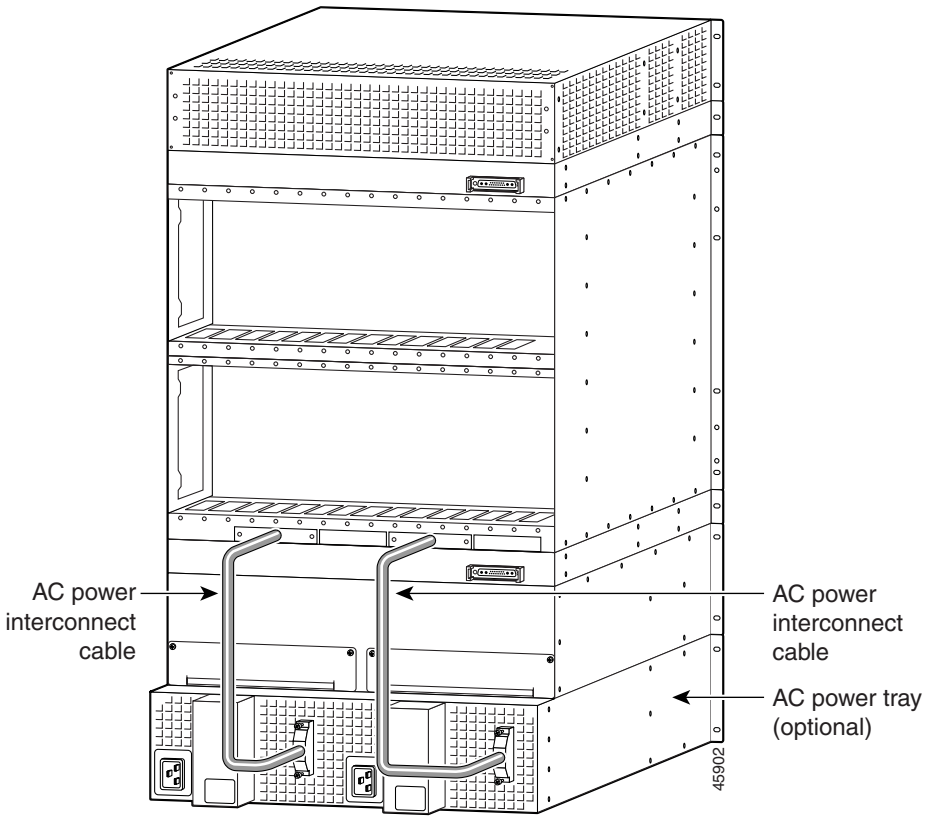
Figure 5-22 AC Power Supply Tray Cabling



Step 5 Repeat Step 1 through Step 4 with the other AC power supply tray cable to connect the second AC power supply tray connector.

Caution Do not plug in the AC power cord at this time.

Connect the DC PEM to the MGX 8850 or MGX 8850/B Switch

Caution Do not use a power screwdriver on captive screws.

Warning **Before working on a chassis or working near power supplies, unplug the power cord on AC units; disconnect the power at the circuit breaker on DC units.** Statement 12

If you are using DC power, complete the following steps to connect the DC PEM to the switch.

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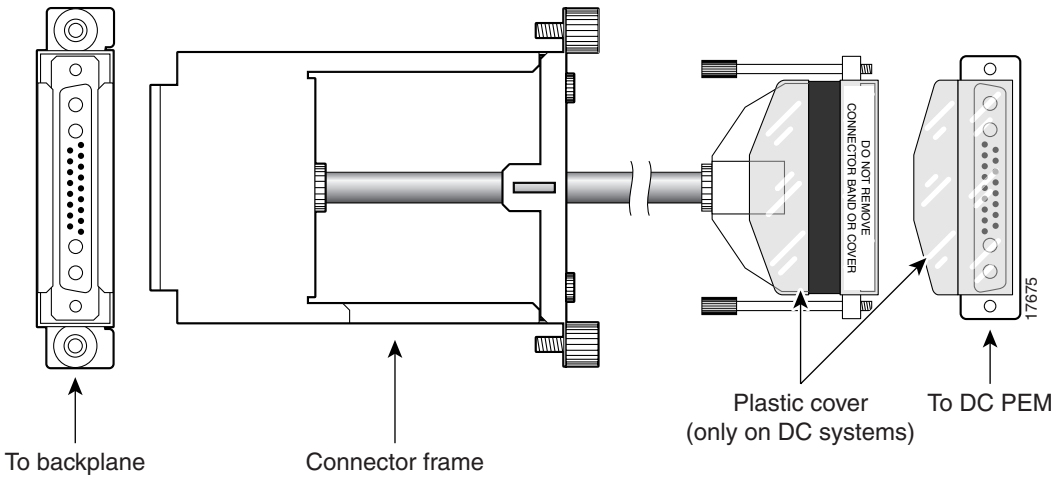
If you are using AC power, see the "Connect the AC Power Supply Tray to the MGX 8850 or MGX 8850/B Switch" section on page 5-37.

Step 1 Notice that the smaller side of the backplane D-connector faces down, and position the smaller side of the cable D-connector so that it also faces down. Figure 5-23 shows the connectors for the DC PEM cable.

Figure 5-23 DC PEM Cable



Step 2 Use both hands to slip the connector frame through the first (source A) or third (source B) access opening at the bottom rear of the card cage. Move the connector straight toward the backplane so that you can guide it through the opening. Be sure that the D-connector is fully inserted in the backplane connector and that the captive screws on the connector frame are clearly aligned with the threaded holes on the chassis.

Step 3 Tighten the captive screws enough to secure the connector frame flush to the chassis. Do not overtighten the screws or use a power screwdriver.

Step 4 Plug the D-connector at the other end of the cable into the first or second DC PEM connector and tighten the captive screws enough to secure the connector. Do not overtighten the screws or use a power screwdriver. Figure 5-24 shows the DC PEM cabling.

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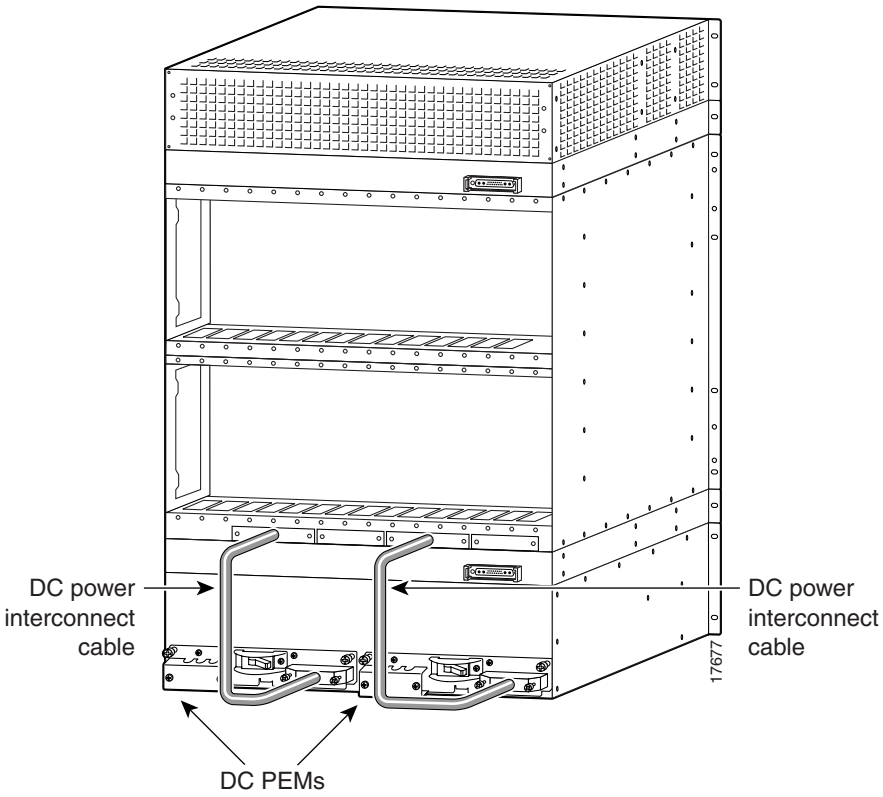
Figure 5-24 DC PEM Cabling



Step 5 If you have installed a redundant DC PEM, repeat Step 1 through Step 4 to connect the second DC PEM connector.

Connect the Back Cards

Connect the interfaces from the back cards to the appropriate end device. See Appendix B, "Cable Specifications" for cabling specifications and pinouts.

Once you have connected your back cards, route the cables through the cable management assembly. The upper card set cables run to the upper cable management panel, and the lower card set cables run to the bottom cable management panel. Figure 5-25 shows cables routed through the upper cable management panel.

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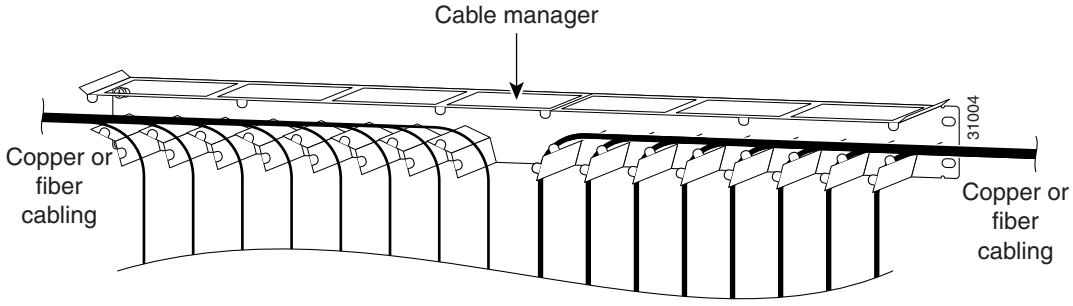
Figure 5-25 Routing Data Cables



Connect the Console Port

The command line interface (CLI) management tool allows you to configure the switch and display the switch status. When a switch starts up for the first time, the only CLI access available is through the console port (CP).

Connect a VT-100 compatible terminal to the CP on the PXM-UI-S3 or PXM-UI-S3/B. Connect the terminal to a power source and set it up using the values that are shown in Table 5-2. Figure 5-26 shows the hardware required for a CP connection.

Figure 5-26 Workstation Connection to the Console Port

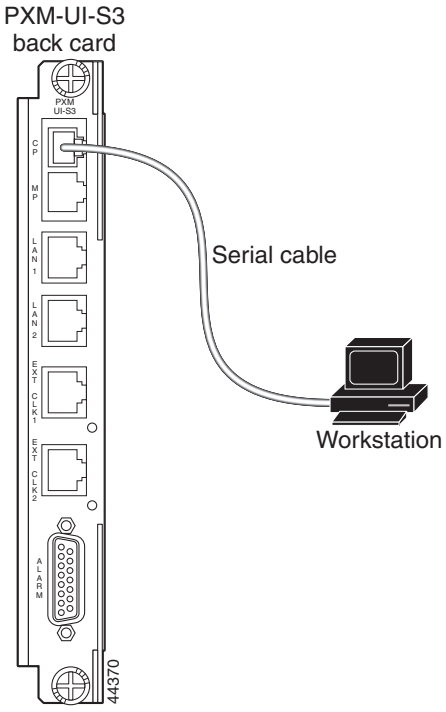


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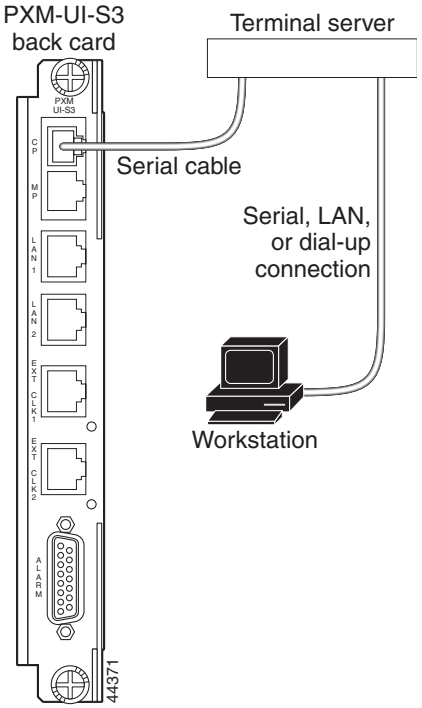
Table 5-2 Terminal Settings

Setting	Value
Baud rate	9600 bps
Character size	8 data bits
Parity	None
Stop bits	1
Hardware flow control	None

The CP connection can also be set up through a terminal server, as shown in Figure 5-27.

Figure 5-27 Terminal Server Connection to the Console Port



For further information about server management and configuration setup, refer to the appropriate software configuration guide for your switch and your release.

Connect Power to the MGX 8850 or MGX 8850/B Switch

The section provides the following installation procedures for connecting power to the switch:

- "Connect AC Power to the Switch" section on page 5-44
- "Connect DC Power to the Switch" section on page 5-44

Warning **Never install an AC power module and a DC power module in the same chassis.** Statement 264

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Warning **Do not touch the power supply when the power cord is connected. For systems with a power switch, line voltages are present within the power supply even when the power switch is off and if the power cord is connected. For systems without a power switch, line voltages are present within the power supply when the power cord is connected.** Statement 4

Connect AC Power to the Switch

Complete the following steps to connect AC power to the switch.

Note The AC power receptacle on the AC power supply tray is an IEC-type with a clamp. The AC voltage range is 180 to 254 VAC. See Table 3-7 for information about the types of AC power cords.

Step 1 Loosen the cable clamp around the AC receptacle on the AC power supply tray to allow clearance for the cable connector.

Step 2 Firmly seat the cable plug in the AC receptacle on the back of the AC power supply tray.

Step 3 Tighten the clamp.

Caution Verify that the branch circuit power is off before you insert the power cable into the wall outlet.

Step 4 Plug the other end of the AC power cord into the wall outlet.

Step 5 Turn on the power source and turn the power switch on.

Step 6 Verify that the fans are running by listening or feeling for air movement. The following LEDs should be lit:

- The AC and DC LEDs on each power supply should be green.
- The Status LED on the PXM1Es or PXM45s should be green.
- The Standby LED on each service module should be yellow.

Connect DC Power to the Switch

Complete the following steps to connect DC power to the switch.

Note Connect the MGX 8850 or MGX 8850/B switch only to a –48-VDC source that complies with the Safety Extra Low Voltage (SELV) requirements in UL 1950, IEC 950, EN 60950, and CSA C22.2 No. 950-95.

If you are installing redundant DC PEMs, you can connect to the same power source if you do not require the additional fault tolerance offered when separate power sources are used.

Step 1 Verify that the power source to the switch is turned off and that the circuit breaker on the DC PEM is off.

Step 2 Use a Phillips-head screwdriver to remove the two screws that hold the plastic cover over the terminal block on the DC PEM (see Figure 5-28 for location).

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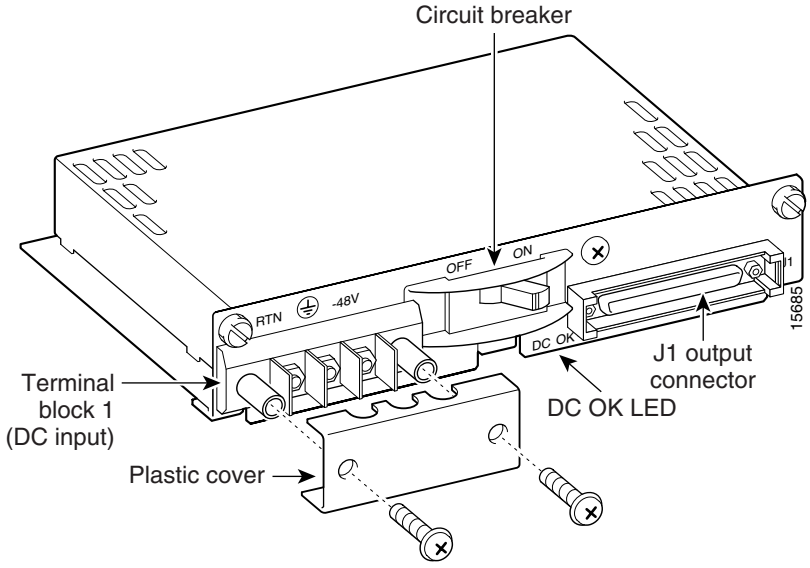
Figure 5-28 DC PEM—Rear View



Step 3 Measure enough wire (6 AWG [10 square mm] or larger three-wire solid or stranded copper wire with insulation rating for 140°F [60°C]) to connect the DC PEM terminal block to the power source.

Note It is recommended that you use the Panduit LC AS6-10-L.

Step 4 Cut the ends of the wire so that the ends are straight, not slanted.

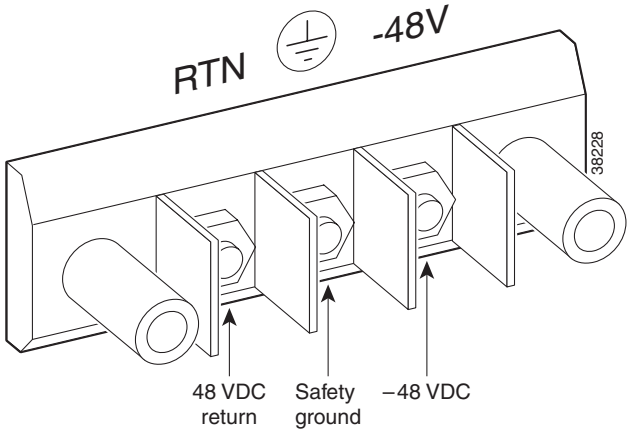
Step 5 Measure 1/4 inch (6 mm) up from one end of the wire and place a mark at that point.

Step 6 Use a wire stripper to remove 1/4 inch (6 mm) of the covering from the end of the wire. Trim the end of the covering so that it is straight, not slanted.

Step 7 Attach a ring or space lug on the end of copper wire you prepared in Step 6. The stripped part of the wire must be fully inserted so that no bare wire is exposed.

Step 8 Attach the end of the wire with the ring or space lug to the 48-VDC return, as shown in Figure 5-29.

Figure 5-29 Terminal Block on the DC PEM



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Step 9 Attach the other end of the wire from Step 7 to the DC source.

Step 10 Repeat Step 3 through Step 7.

Step 11 Attach the end of the wire (from Step 10) with the ring or space lug to the –48 VDC connector, as shown in Figure 5-29.

Step 12 Attach the other end of the wire from Step 10 to the DC source.

Step 13 Use a Phillips-head screwdriver and two screws to attach the plastic cover over the terminal block on the DC PEM.

Step 14 Turn on the power source and turn the power switch on.

Step 15 Verify that the fans are running by listening or feeling for air movement. The following LEDs should be lit:

- The AC and DC LEDs on each power supply should be green.
- The DC OK LED on each DC PEM should be green.
- The Status LED on the PXM1Es or PXM45s should be green.
- The Standby LED on each service module should be yellow.

Connect the External Clock

This step is optional. For information, see "Connect the External Clock" section on page B-7.

Connect the Alarms

Note This step is optional.

Dry contact relay closures are available for forwarding switch alarms to an alarm system. Separate visual and audible alarm outputs are available for critical, major, and minor alarm outputs, and the outputs are provided through the use of a DB-15 connector on the PXM user interface back card (PXM-UI-S3 and PXM-UI-S3/B).

Complete the following steps to connect the external clock:

Step 1 Verify that you have a PXM-UI-S3 or PXM-UI-S3/B back card installed in slots 7 and 8 in the upper rear bay of the switch.

Step 2 Connect the DB-15 cable to the ALARM port on the PXM-UI-S3 or PXM-UI-S3/B back card.

Note See Appendix B, "Cable Specifications" for cable requirements.

Step 3 Connect the other end of the cable to the alarm source.

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Connect the MP Connection

Note This step is optional.

A dial-up connection extends switch management to all workstations that have access to the public switched telephone network (PSTN).

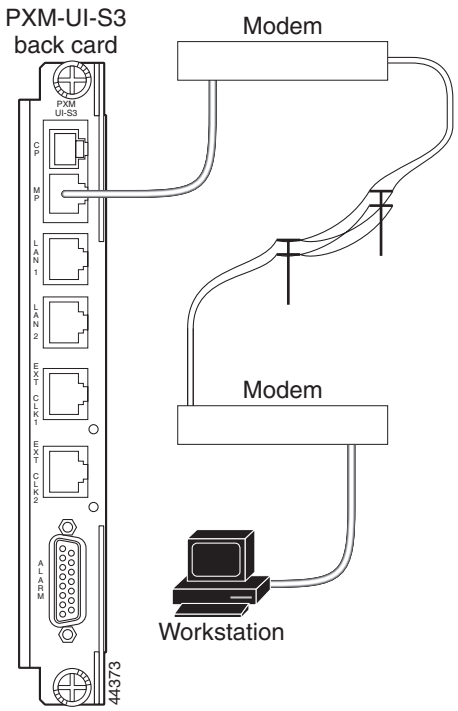
PXM-UI-S3

Connect the maintenance port (MP) on the PXM-UI-S3 card to a modem. Connect the terminal to a power source and set it up using the values that are shown in Table 5-2. This modem is connected through the PSTN and is accessible from a workstation, as shown in Figure 5-30.

PXM-UI-S3/B

A PXM-UI-S3/B card does not have a maintenance port. For the PXM-UI-S3/B card, a modem can be connected to the console port instead of the MP.

Figure 5-30 Modem Connection to the Maintenance Port



For further information about server management and configuration setup, refer to the appropriate software configuration guide for your switch and your release.

Connect the LAN1/2 Ports

Note This step is optional.

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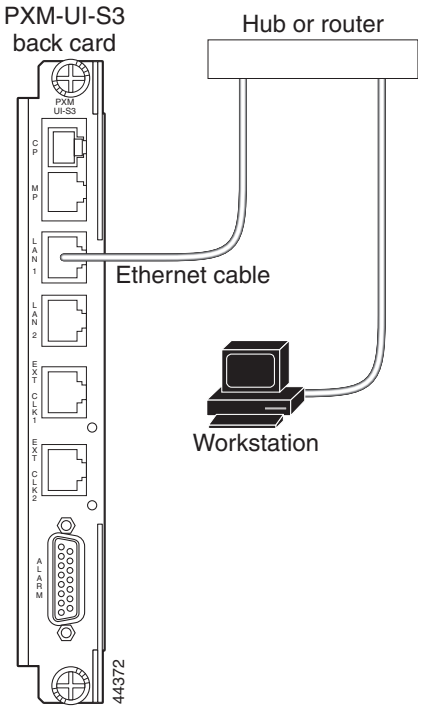
A local LAN connection extends switch management to all workstations that have connectivity to the LAN to which the switch is connected.

Connect the LAN 1 port on the PXM-UI-S3 or PXM-UI-S3/B to a hub or router. This hub or router is connected to a workstation, as shown in Figure 5-31.

Figure 5-31 Ethernet Connection to the LAN 1 Port



Note The LAN 2 port in Figure 5-31 is not enabled.

For further information about server management and configuration setup, refer to the appropriate software configuration guide for your switch and your release.

Verify EMI Compliance

Warning **Blank faceplates and cover panels serve three important functions: they prevent exposure to hazardous voltages and currents inside the chassis; they contain electromagnetic interference (EMI) that might disrupt other equipment; and they direct the flow of cooling air through the chassis. Do not operate the system unless all cards, faceplates, front covers, and rear covers are in place.** Statement 1029

Step 1 If your switch has an (optional) front door, verify that the door is installed and closed *and* that each empty slot is covered by a blank faceplate.

Step 2 Install the ferrite bead if needed. Refer to "Installing the Ferrite Bead on the PXM-UI-S3/B Card" section on page 5-133.

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Note Refer to the appropriate software configuration guide for your switch and your release to configure general switch features.

Installing the MGX 8950 Switch

This section provides procedures for installing a MGX 8950 switch in a rack or in a Cisco-supplied cabinet.

Caution Due to the weight of the switch, it is recommended that a mechanical lift be used to install the Cisco MGX 8950 switch in a rack.

Warning **Only trained and qualified personnel should be allowed to install or replace this equipment.** Statement 49

Warning **This unit is intended for installation in restricted access areas. A restricted access area is where access can only be gained by service personnel through the use of a special tool, lock and key, or other means of security, and is controlled by the authority responsible for the location.** Statement 37

Caution Before you begin the installation procedures, read the entire section for important information and safety warnings.

Note Before installing and cabling the equipment, be aware of standard safety practices and the hazards involved in working with electrical circuitry to prevent accidents. See the "Safety Requirements" section on page 3-2 for cautions and warnings that are necessary to ensure a safe and hazard-free installation.

To see translations of the warnings that appear in this guide, refer to the *Regulatory Compliance and Safety Information for Cisco Multiservice Switch Products (MGX, BPX, and SES)* that shipped with your chassis.

Installation Checklist

When you install a MGX 8950 system, be sure that you follow the installation procedures in the proper sequence. Table 5-1 is a checklist of the installation steps in the order in which they should occur. Detailed installation instructions are located in the sections following Table 5-1.

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The MGX 8950 switch is shipped in one of two hardware configurations:

- Open rack—Modules and cards are shipped preinstalled in a the Cisco MGX 8950 switch and are tested according to customer specifications before they are shipped. The system is ready for installation in a customer-supplied open rack. The optional AC power supply tray, air intake plenum, upper and lower fan trays, and exhaust plenum are packaged separately and will need to be installed in the rack.

  If you are not using a mechanical lift, you will need to remove the modules and cards from the MGX 8950 switch to lessen the weight of the chassis prior to installing it in the rack. Follow the installation procedures in the "Rack-Mounted System (Without Lift)" column of Table 5-1.

  If you are using a lift to mount the MGX 8950 switch in a rack, you do not need to remove the modules, cards, and hardware components. Follow the installation procedures in the "Rack-Mounted System (with Lift)" column of Table 5-1.

- Cisco cabinet—All components are shipped preinstalled in a Cisco cabinet. Follow the installation procedures in the "Cisco Cabinet System" column of Table 5-1.

Note Using a lift to install a fully loaded MGX 8950 switch in a rack greatly simplifies the installation process, because the modules do not need to be removed from the chassis.

Before proceeding with the installation, verify that all of the ordered parts are present and in good condition. Store a record of the parts and serial numbers. If any parts are missing or damaged, contact your sales representative.

Caution Proper ESD protection is required whenever you handle Cisco equipment. Installation and maintenance personnel should be properly grounded through the use of grounding straps to eliminate the risk of ESD damage to the equipment. Modules are subject to ESD damage whenever they are removed from the chassis.

Table 5-3 Installation Checklist—MGX 8950 System

Check	Steps	Rack-Mounted System (Without Lift)	Rack-Mounted System (with Lift)	Cisco Cabinet System
	Step 1	Install Stability Plate for Seismic Anchoring		
	Step 2	Ground the Frame Bonding Ground Connection for a Cisco-Supplied Rack		
	Step 3	Measure Rack Space		Connect the Fan Tray Power Cables to the MGX 8950 Switch
	Step 4	Connect the Fan Tray Power Cables to the MGX 8950 Switch		
	Step 5	Install the AC Power Supply Tray, as necessary • Remove the AC Power Supplies from the AC Power Supply Tray • Install the AC Supply Power Tray(s) • Reinstall the AC Power Supplies		Connect the DC PEM to the MGX 8950 Switch, as necessary
	Step 6	Install the Air Intake Plenum		Connect the Back Cards
	Step 7	Install the Lower Fan Tray		Connect the Console Port

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Table 5-3 Installation Checklist—MGX 8950 System (continued)

Check	Steps	Rack-Mounted System (Without Lift)	Rack-Mounted System (with Lift)	Cisco Cabinet System
	Step 8	Install the MGX 8950 Switch with a Mechanical Lift • Prepare for Installation • Remove the Front Cards • Remove the Back Cards • Remove the Back Cards from an APS Assembly • Install the Switch in the Rack • Reinstall the APS Assembly • Reinstall the Back Cards • Reinstall the Front Cards	Install the MGX 8950 Switch with a Mechanical Lift • Install the Switch in a 19-Inch or 23-Inch Rack • Install the Switch in a 19-Inch Cabinet	Connect Power to the MGX 8950 Switch • Connect AC Power to the Switch • Connect the Console Port
	Step 9	Install the Upper Fan Tray		Connect the External Clock (optional)
	Step 10	Install the Exhaust Plenum		Connect the Alarms (optional)
	Step 11	Install the DC PEM(s), as necessary		Connect the MP Connection (optional)
	Step 12	Install the Cable Management Assembly		Connect the LAN1/2 Ports (optional)
	Step 13	Connect the Fan Tray Power Cables to the MGX 8950 Switch		Verify EMI Compliance
	Step 14	Connect the AC Power Supply Tray to the MGX 8950 Switch, as necessary		
	Step 15	Connect the DC PEM to the MGX 8950 Switch, as necessary		
	Step 16	Connect the Back Cards		
	Step 17	Connect the Console Port		
	Step 18	Connect Power to the MGX 8950 Switch • Connect AC Power to the Switch • Connect the Console Port		
	Step 19	Connect the External Clock (optional)		
	Step 20	Connect the Alarms (optional)		
	Step 21	Connect the MP Connection (optional)		
	Step 22	Connect the LAN1/2 Ports (optional)		
	Step 23	Verify EMI Compliance		

Note After completing these steps, proceed to the "First Time Power On Procedure for MGX Switches" section on page 5-137 if this is a first-time installation.

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Installation Procedures

Caution The switch should not receive power while you install components.

The following sections detail the installation procedures for the MGX 8950 system:

- Install Stability Plate for Seismic Anchoring, page 5-52
- Ground the Frame Bonding Ground Connection for a Cisco-Supplied Rack, page 5-55
- Measure Rack Space, page 5-57
- Prepare for Rack Installation, page 5-58
- Install the AC Power Supply Tray, page 5-61
- Install the Air Intake Plenum, page 5-64
- Install the Lower Fan Tray, page 5-64
- Install the MGX 8950 Switch without a Mechanical Lift, page 5-65
- Install the MGX 8950 Switch with a Mechanical Lift, page 5-74
- Install the Upper Fan Tray, page 5-76
- Install the Exhaust Plenum, page 5-76
- Install the DC PEM(s), page 5-77
- Install the Cable Management Assembly, page 5-78
- Connect the Fan Tray Power Cables to the MGX 8950 Switch, page 5-78
- Connect the AC Power Supply Tray to the MGX 8950 Switch, page 5-80
- Connect the DC PEM to the MGX 8950 Switch, page 5-84
- Connect the Back Cards, page 5-88
- Connect the Console Port, page 5-89
- Connect Power to the MGX 8950 Switch, page 5-90
- Connect the External Clock, page 5-95
- Connect the Alarms, page 5-95
- Connect the MP Connection, page 5-95
- Connect the LAN1/2 Ports, page 5-96
- Verify EMI Compliance, page 5-97

Install Stability Plate for Seismic Anchoring

You can anchor your Cisco-supplied rack or cabinet to the floor with an optional stability plate designed for seismic anchoring.

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Note These instructions are specific to a Cisco-supplied cabinet, but can be used for anchoring a Cisco-supplied rack. If you are not installing your system in a Cisco-supplied rack or cabinet, anchor your third-party rack or vendor cabinet according to guidelines in the third-party vendor documentation.

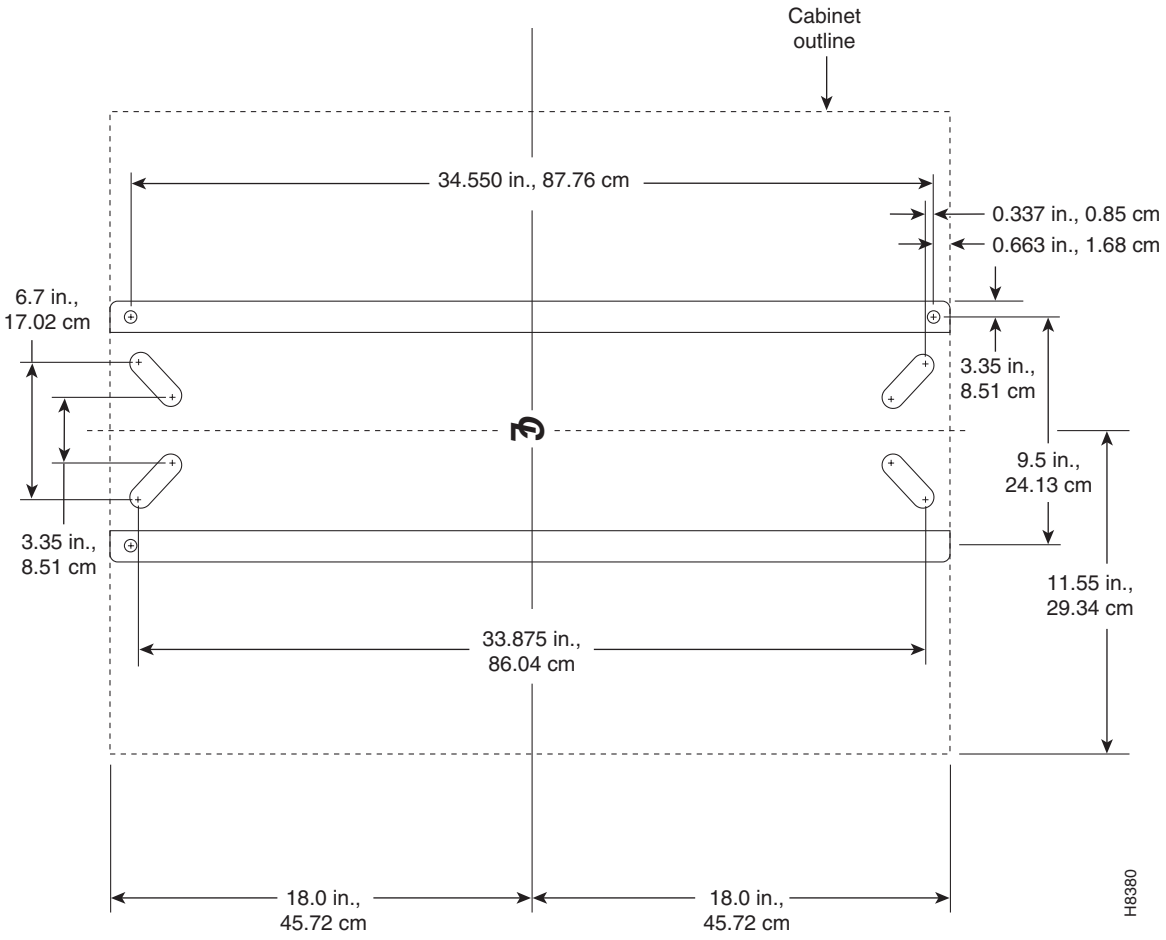
The slots in the stability plate use up to 5/8-inch anchor bolts.

Caution When moving a Cisco-supplied cabinet, do not push the cabinet at its sides. Instead, grip the front or back edges of the cabinet.

Complete the following steps to anchor your Cisco cabinet to a stability plate:

Step 1 Drill holes into the floor to install the stability plate. See Figure 5-32 for the dimensions.

Figure 5-32 Stability Plate Dimensions



Step 2 Use four 3/8 x 1 inch anchoring bolts (user-provided) to attach the stability plate to the floor.

Step 3 Roll the Cisco cabinet over the stability plate as shown in Figure 5-33.

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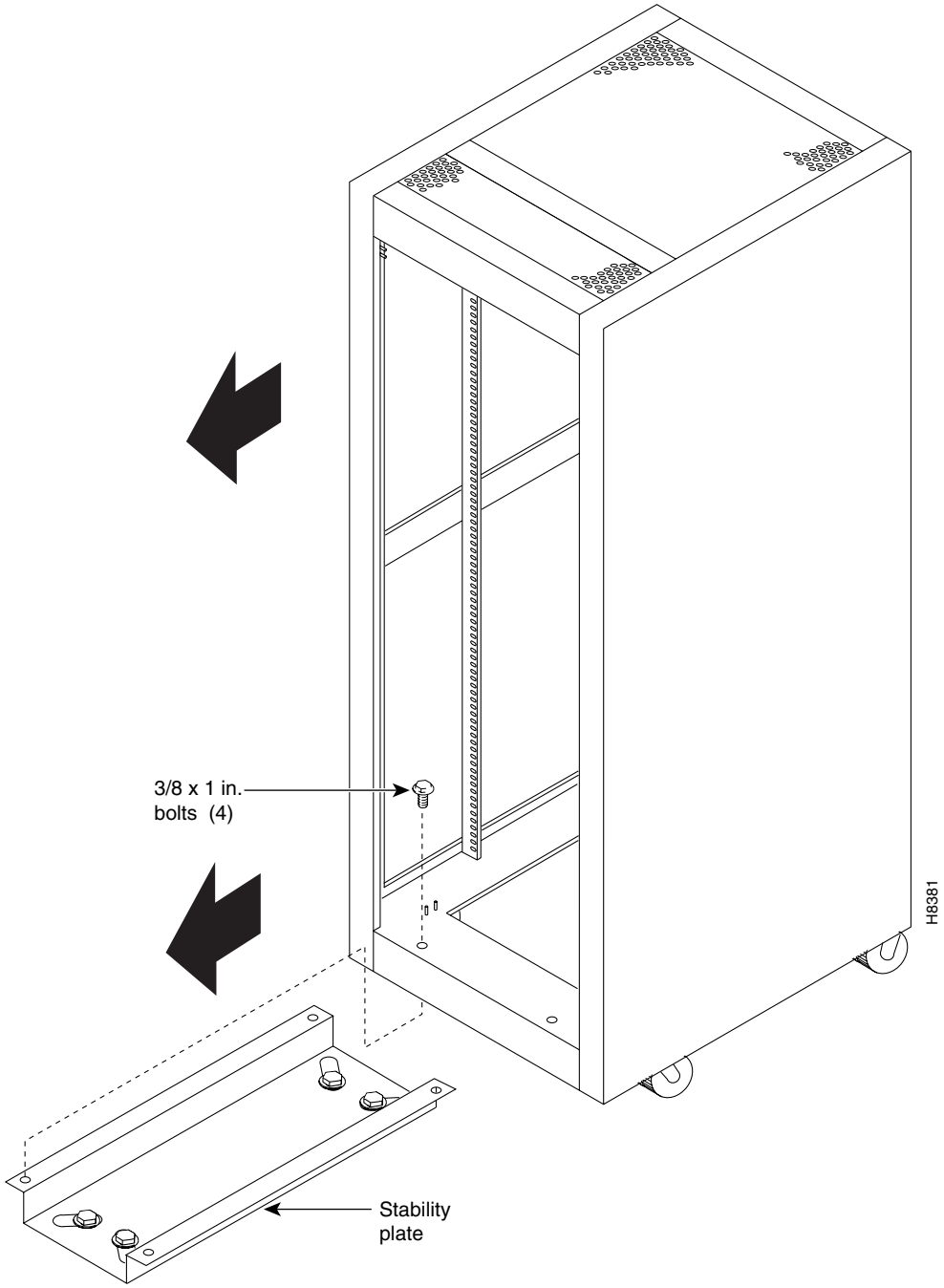
Figure 5-33 Installing a Cisco Cabinet over the Stability Plate



Step 4 Use four 3/8 x 1 inch anchoring bolts (user-provided) to secure the cabinet to the stability plate.

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Ground the Frame Bonding Ground Connection for a Cisco-Supplied Rack

A Cisco-supplied rack has two pairs of grounding studs located at the top and bottom of the rack. The rack comes with the hardware needed to secure a ground conductor to the grounding studs. The grounding studs measure 1/4 inch by 20 threads per inch. The grounding studs can accept a two-holed grounding connector designed to prevent rotation and possible loosening of the connector.

Note If you are installing your switch in a third-party vendor rack or cabinet, ensure that the rack and cabinet are properly grounded.

Caution The chassis ground wire must be the same size as the return conductor so that it can carry the entire battery load. See the "Wiring a Mixed Ground System with Redundant Supplies" section on page C-9 for more information.

Caution When moving a Cisco-supplied cabinet, do not push the cabinet at its sides. Instead, grip the front or back edges of the cabinet.

The ground conductor is typically connected to the building earth wiring, usually at a power distribution board. Complete the following steps to attach a ground conductor to the frame of a Cisco rack:

Step 1 Place the external, toothed star washers onto a stud. Figure 5-54 shows a Cisco cabinet with the frame bonding connection studs in the upper and lower parts of the cabinet. Only one of the studs is needed to make the connection. A ground symbol on the Cisco rack indicates the points of attachment.

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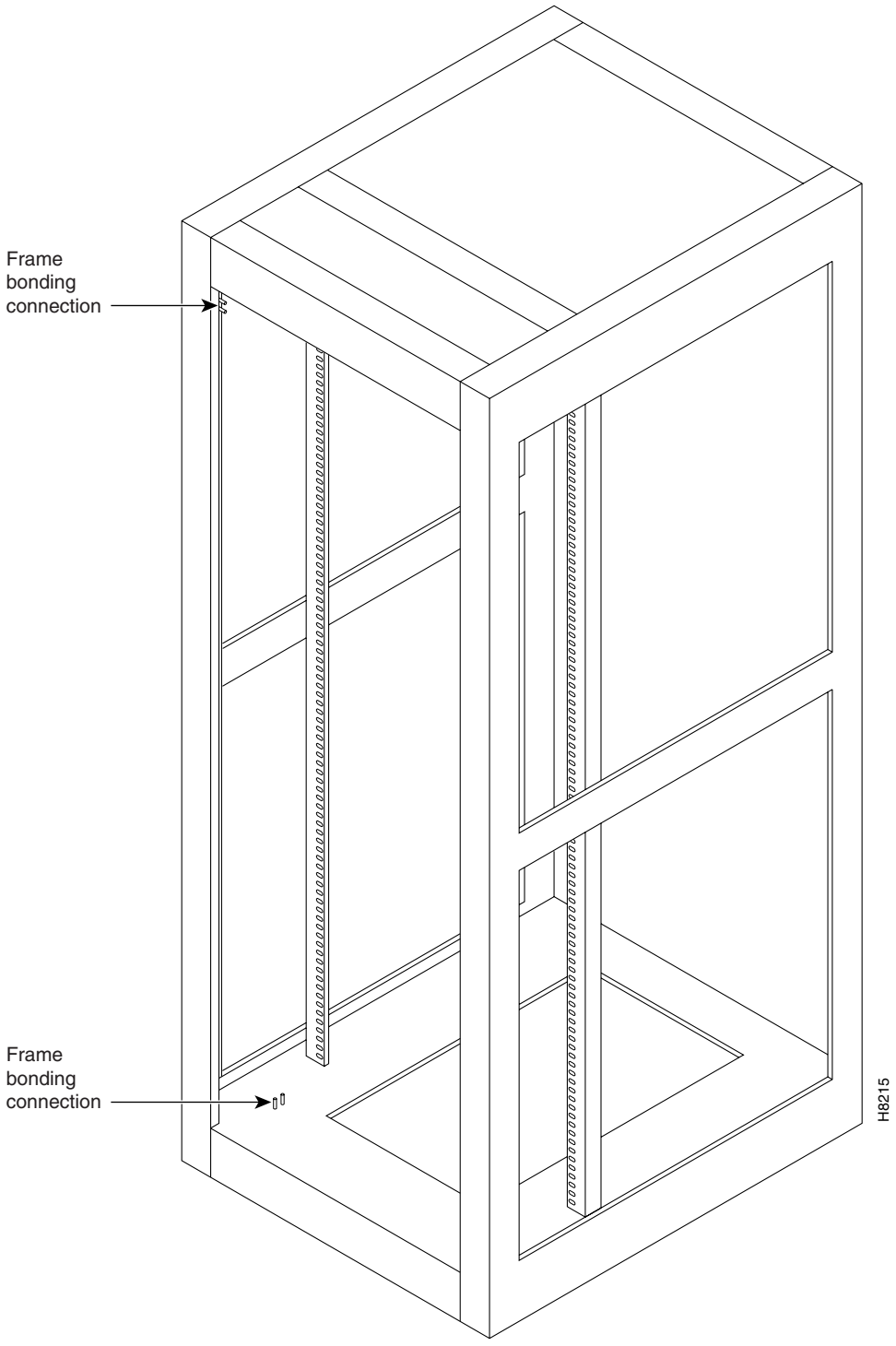
Figure 5-34 Frame Bonding Connection in Cisco-Supplied Rack



Step 2 Place the connector that terminates the grounding conductor closed-loop ring or two-hole compression fitting onto the studs.

Step 3 Place another external, toothed star washer or lock washer onto the studs.

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Step 4 Use a wrench to tighten a nut onto the threaded studs.

Measure Rack Space

Before you install the MGX 8950 switch and its related components, calculate the total rack space required to install your system. See Table 3-10 on page 3-31 for the MGX 8950 switch dimensions and rack units (RUs) required.

System components must be installed in the rack in the following sequence, beginning at the bottom of the rack or cabinet (see Figure 5-35):

1. AC power supply tray with power supply modules (optional)

Note If a second AC power supply tray is used (optional), install it just above the first AC power supply tray and below the air intake plenum.

2. Air intake plenum
3. Lower fan tray
4. MGX 8950 switch (with optional door)
5. Upper fan tray
6. Exhaust plenum

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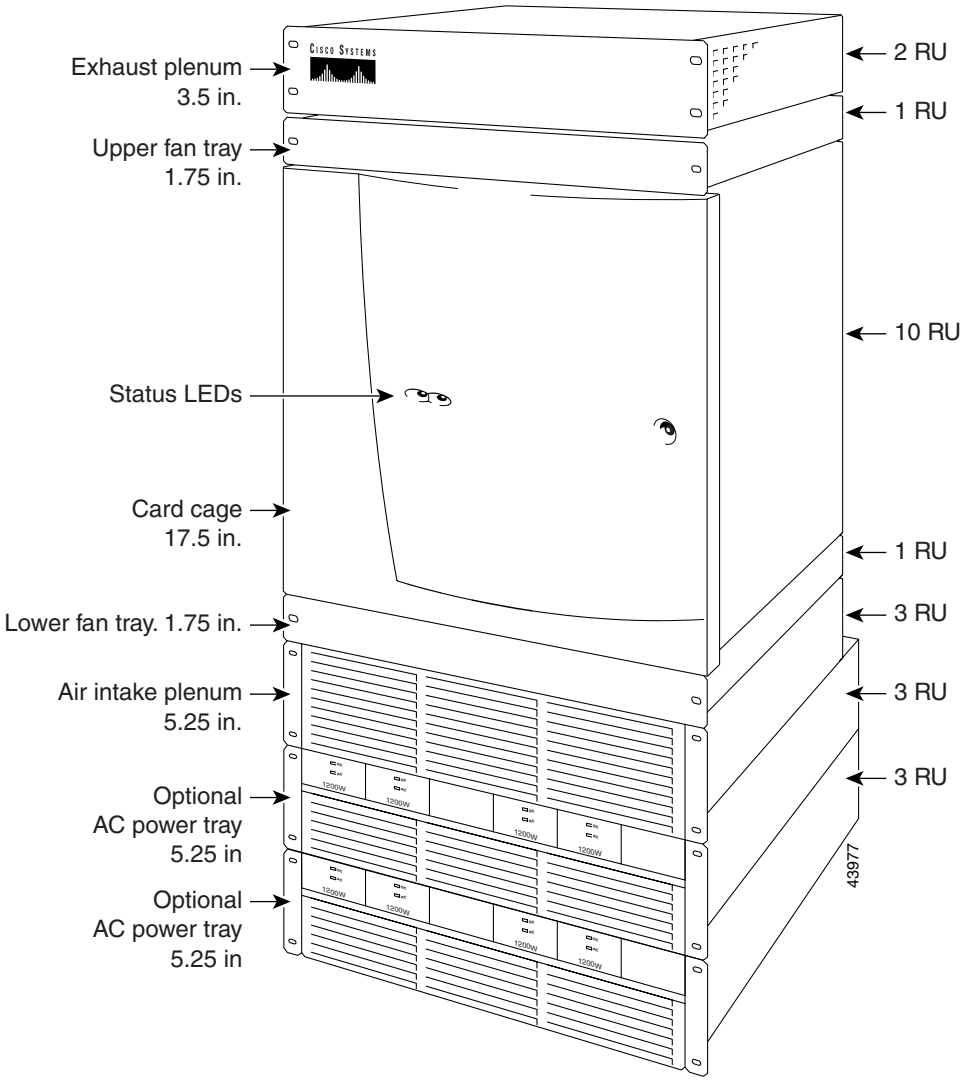
Figure 5-35 Component Locations in a MGX 8950 System



Note If you plan to expand your system to include more switches in the future, allow space in the rack for additions, keeping in mind the weight distribution and stability of the rack.

Prepare for Rack Installation

The minimum distance between left and right mounting rails (as you face the rack) must be 17.75 inches or 45.08 cm. (Some 19-inch racks have only 17.50 inches between the rails.) The width of the components, such as the card cage and fan tray, is 17.72 inches.

When installing a MGX 8950 system in a 19-inch rack, adhere to the following guidelines:

- Open-rack configuration—The switch and hardware components (optional AC power supply tray, air intake plenum, upper and lower fan trays, and exhaust plenum) need to be mid-mounted in the rack. Brackets for that purpose are included with the system.

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- Cisco cabinet configuration—The switch and hardware components (optional AC power supply tray, air intake plenum, upper and lower fan trays, and exhaust plenum) are shipped front-mounted in the enclosure, and the rear of each component is supported by a rear bracket.

When you are installing a MGX 8950 system in a 23-inch rack, the switch and hardware components (optional AC power supply tray, air intake plenum, upper and lower fan trays, and exhaust plenum) need to be mid-mounted in the rack. You need special mounting brackets to mid-mount the components in a 23-inch rack (mounting kit, Cisco Part Number MGX-MNT23-8950).

Figure 5-36 shows the mounting rail distances for front, middle, and rear-mounting rails.

Figure 5-36 Mounting Rail Distances

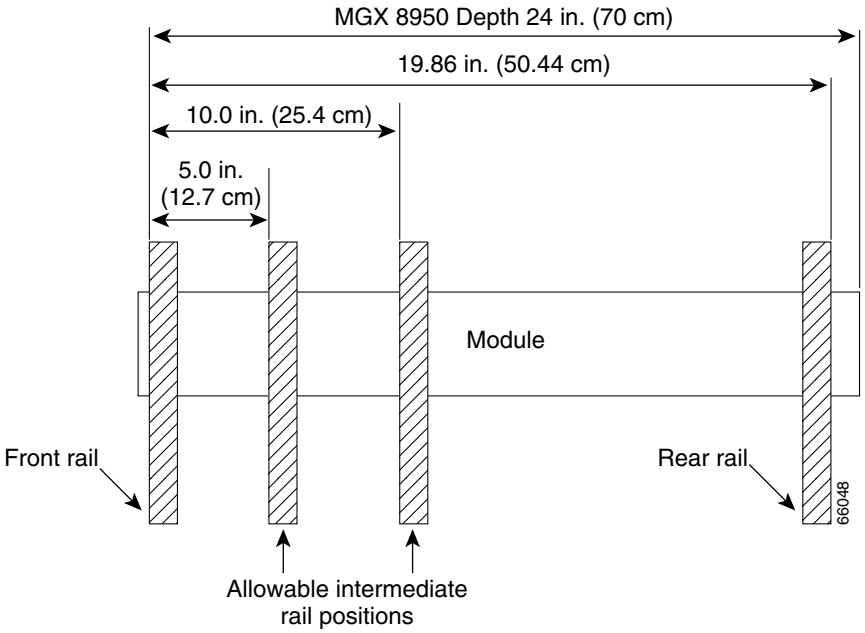

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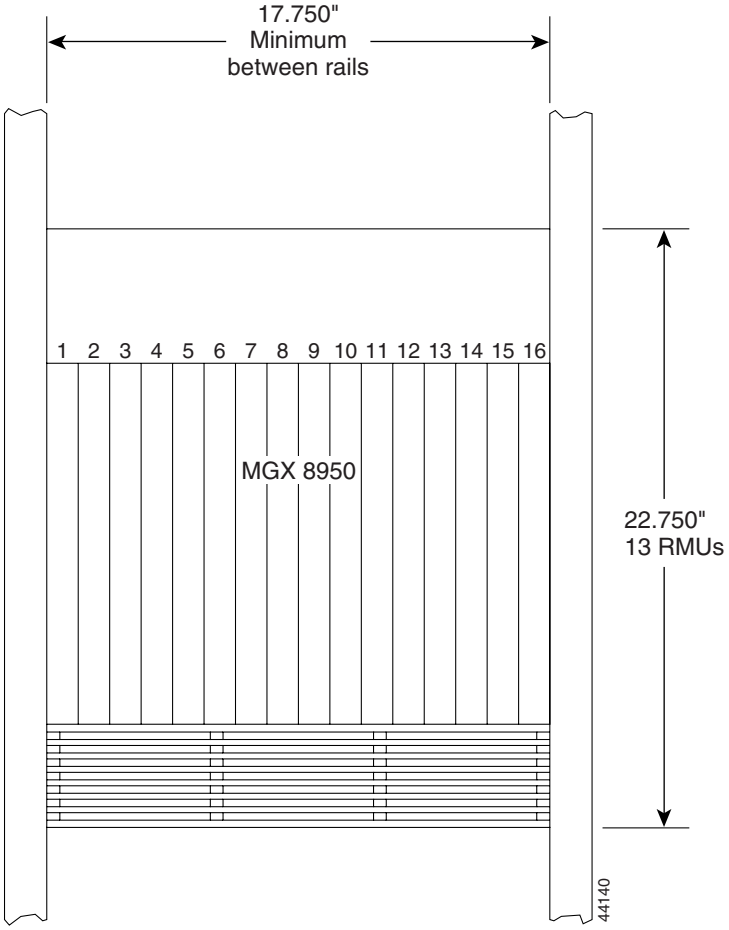
Figure 5-37 shows a front view of the mounting rails.

Figure 5-37 Rack Mounting Dimensions—Front View



Tip If a component requires more than two screws for installation in the rack or cabinet, install the two bottom screws first.

Caution Make sure that mounting the equipment does not create a hazardous condition due to uneven mechanical loading. The equipment rack should be securely supported.

Warning **To prevent bodily injury when mounting or servicing this unit in a rack, you must take special precautions to ensure that the system remains stable. The following guidelines are provided to ensure your safety:**

—This unit should be mounted at the bottom of the rack if it is the only unit in the rack.

—When mounting this unit in a partially filled rack, load the rack from the bottom to the top with the heaviest component at the bottom of the rack.

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—If the rack is provided with stabilizing devices, install the stabilizers before mounting or servicing the unit in the rack. Statement 1006

Install the AC Power Supply Tray

Note AC power supply trays are optional for the MGX 8950 switch. If your system uses only DC power, proceed to the "Install the Air Intake Plenum" section on page 5-64.

Before installing the AC power supply tray, you should remove the power supplies from the tray. Removing the AC power supplies makes the AC power tray easier to install. For a mid-mount installation, you must remove the power supplies from the power supply tray before installing the tray.

This section contains the following procedures:

- Remove the AC Power Supplies from the AC Power Supply Tray, page 5-61
- Install the AC Supply Power Tray(s), page 5-62
- Reinstall the AC Power Supplies, page 5-63

Tip If a component requires more than two screws for installation in the rack or cabinet, install the two bottom screws first.

Warning **Before working on a system that has an On/Off switch, turn OFF the power and unplug the power cord.** Statement 1

Warning **Never install an AC power module and a DC power module in the same chassis.** Statement 264

Warning **Before working on a chassis or working near power supplies, unplug the power cord on AC units; disconnect the power at the circuit breaker on DC units.** Statement 12

Remove the AC Power Supplies from the AC Power Supply Tray

Tip Before removing the AC power supplies from the tray, record the location of each power supply.

Complete the following steps to remove an AC power supply from the AC power supply tray:

Step 1 Place the AC power supply tray on a flat and stable surface (for example, a table top).

Step 2 Insert a small flat-blade (0.20 inch wide maximum) screwdriver in the access hole at the top of the air intake grille, as shown in Figure 5-38. Rotate the screwdriver in either direction until the latch opens.

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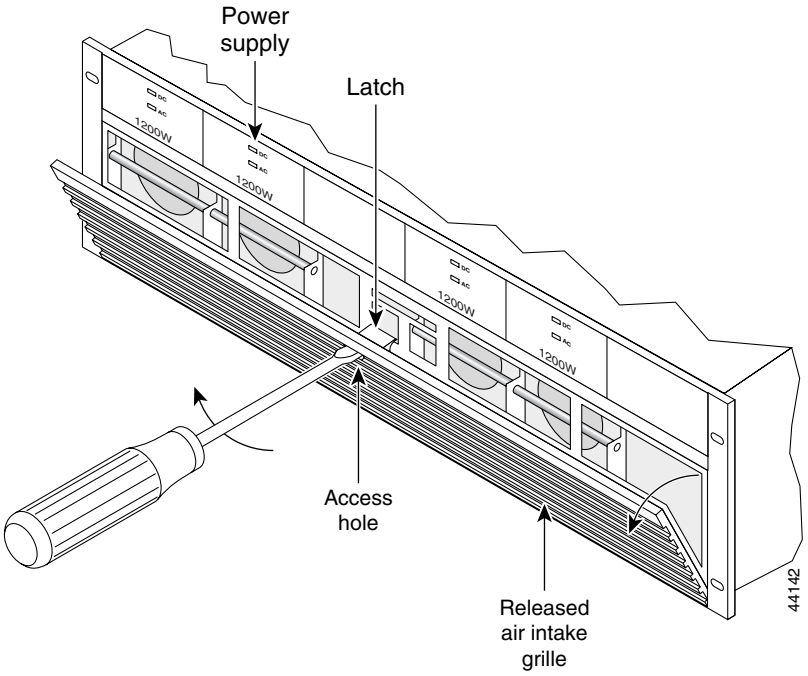
Figure 5-38 Removing an AC Power Supply



Step 3 Tilt the air intake grille down to about a 45-degree angle, lift it out, and set it aside. This exposes the hinged door that serves as the power supply retainer bracket.

Step 4 With a flat-blade screwdriver, unscrew the captive retainer screw in the center of the hinged door and tilt the door down.

Step 5 Loosen the captive screw at the bottom front of the AC power supply that you want to remove.

Step 6 Grip the handle and carefully remove the AC power supply by pulling it toward you.

Step 7 Repeat Step 5 and Step 6 for each AC power supply present in each AC power supply tray.

Install the AC Supply Power Tray(s)

Complete the following steps to install the AC power supply tray(s):

Note For optimum performance, it is recommended that you install dual AC power systems for full redundancy.

Step 1 Use mounting screws and a Phillips-head screwdriver to attach the mid-mounting brackets to the AC power supply tray if you are installing the system in a 19-inch or 23-inch rack. Insert each mounting screw from the inside of the AC power supply tray so that the nut is on the outside of the tray. A mounting kit is needed for a 23-inch rack (Cisco Part Number MGX-MNT23-8950).

Note If you are installing the AC power supply tray in a 19-inch cabinet, it is front-mounted in the rack with support from rear brackets.

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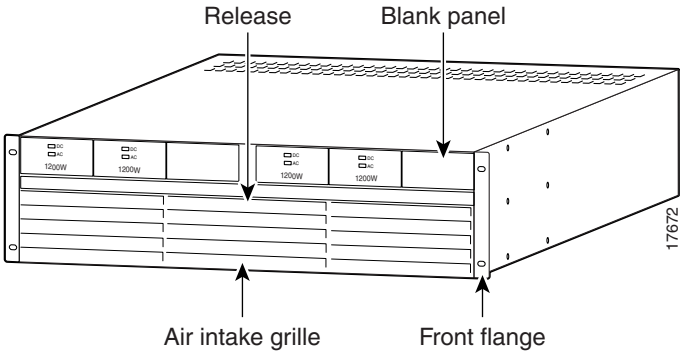
Step 2 Position the AC power supply tray, which occupies 3 RUs of space, at the bottom of the configuration or rack.

Step 3 Use four mounting screws and a Phillips-head screwdriver to bolt the AC power supply tray in the rack. See Figure 5-39 for the correct placement of the AC power supply tray.

Step 4 While you secure the front of the AC power supply tray with the front screw, hold the adjacent front flange of the tray slightly to the outside so that the hinged door can freely open and close. (See "Front flange" in Figure 5-39.) The space between the right-angle edge of the flange and the edge of the hinged door should be approximately 0.030 inch (about the thickness of a thumbnail).

Figure 5-39 AC Power Supply Tray—Front View



Step 5 If you are installing the AC power supply tray in a 19-inch cabinet, attach the rear mounting brackets to the rack and use screws to secure the tray to the rear-mounting brackets.

Step 6 Repeat Step 1 through Step 5 to install a second AC power supply tray.

Reinstall the AC Power Supplies

Complete the following steps to reinstall power supplies that you have removed.

Caution Do not use a power screwdriver on captive screws.

Step 1 Slide each AC power supply into the AC power supply tray. You will encounter a slight resistance as you slide the AC power supply; apply even pressure to ensure full connector mating.

Step 2 Secure each AC power supply to the tray by tightening the captive screw at the front bottom of each AC power supply. For slots without a power supply, the hinged door on the tray should already have a removable blank panel.

Step 3 Rotate the hinged door and tighten the captive retainer screw in the center of the hinged door using a flat-blade screwdriver.

Step 4 Replace the air intake grille by putting the lower hooks over the hinged panel and then rotating the grille until it snaps into place.

Step 5 Repeat Step 1 through Step 4 to reinstall the AC power supplies in a second AC power supply tray. Refer to Table 3-13 to verify that you have the number of power supplies needed for your system.

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Install the Air Intake Plenum

Complete the following steps to install the air intake plenum.

Tip If a component requires more than two screws for installation in the rack or cabinet, install the two bottom screws first.

Step 1 If you are installing the system in a 19-inch or 23-inch rack, place the air intake plenum on a flat and stable surface (for example, a table top). Use mounting screws and a Phillips-head screwdriver to attach the mid-mounting brackets to the air intake plenum. You need a mounting kit to accommodate a 23-inch rack (Cisco Part Number MGX-MNT23-8950).

Note If you are installing the air intake plenum in a 19-inch cabinet, it is front-mounted in the rack with support from rear brackets.

Step 2 Position the air intake plenum, which occupies 3 RUs of space, either at the bottom of the configuration or rack (for a DC-powered system) or directly above the AC power supply tray (for an AC-powered system).

Step 3 Use four mounting screws and a Phillips-head screwdriver to bolt the air intake plenum in the rack. See Figure 5-5 for the correct placement of the air intake plenum.

Step 4 If you are installing the air intake plenum in a 19-inch cabinet, attach the rear-mounting brackets to the rack and use screws to secure the air intake plenum to the rear-mounting brackets.

Install the Lower Fan Tray

Complete the following steps to install the lower fan tray.

Tip If a component requires more than two screws for installation in the rack or cabinet, install the two bottom screws first.

Step 1 If you are installing the system in a 19-inch or 23-inch rack, place the lower fan tray on a flat and stable surface (for example, a table top). Use mounting screws and a Phillips-head screwdriver to attach the mid-mounting brackets to the lower fan tray. You need a mounting kit to accommodate a 23-inch rack (Cisco Part Number MGX-MNT23-8950).

Note If you are installing the fan tray in a 19-inch cabinet, it is front-mounted in the rack with support from rear brackets.

Step 2 Position the lower fan tray, which occupies 1 RU of space, directly above the air intake plenum.

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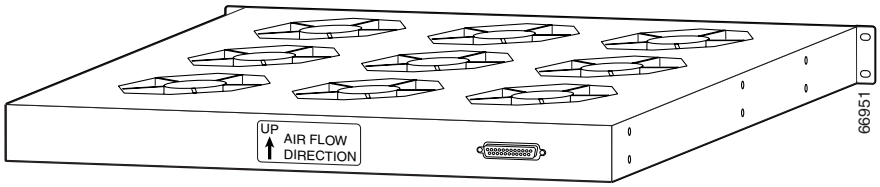
Ensure that the air flow direction arrow on the back of the lower fan tray is pointing up, as shown in Figure 5-40.

Figure 5-40 Lower Fan Tray Air Flow Direction



Step 3 Use four mounting screws and a Phillips-head screwdriver to bolt the lower fan tray in the rack. See Figure 5-5 for the correct placement of the lower fan tray.

Step 4 If you are installing the fan tray in a 19-inch cabinet, attach the rear-mounting brackets to the rack and use screws to secure the fan tray to the rear-mounting brackets.

Install the MGX 8950 Switch without a Mechanical Lift

Caution Because of the risk of damage to the cards, modules, and backplane, it is strongly recommended that a mechanical lift be used. Using a lift greatly simplifies the installation and reduces the risk of damage. See "Install the MGX 8950 Switch with a Mechanical Lift" section on page 5-74 for more information about installing the MGX 8950 switch with a mechanical lift.

If a mechanical lift is not available for installation, the switch must be manually lifted into place. Since the switch is shipped with all components preinstalled, you must remove the cards and modules from the switch so that you can lift it into the rack.

The following sections contain instructions for installing a switch without the use of a mechanical lift:

- "Prepare for Installation" section on page 5-66
- "Remove the Front Cards" section on page 5-66
- "Remove the Back Cards" section on page 5-67
- "Remove the Back Cards from an APS Assembly" section on page 5-67
- "Install the Switch in the Rack" section on page 5-68
- "Install the Switch in a 19-Inch or 23-Inch Rack" section on page 5-69
- "Install the Switch in a 19-Inch Cabinet" section on page 5-69
- "Reinstall the APS Assembly" section on page 5-69
- "Reinstall the Back Cards" section on page 5-71
- "Reinstall the Front Cards" section on page 5-73

Tip If a component requires more than two screws for installation in the rack or cabinet, install the two bottom screws first.

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Prepare for Installation

Review the following guidelines before installation begins:

- Before removing any cards, modules, or assemblies, it is recommended that you carefully note and write down their location or slot number in the chassis.
- Verify that your ESD grounding wrist strap is properly connected. See the "Preventing ESD Damage" section on page 3-7 for detailed information about ESD procedures.

Remove the Front Cards

Complete the following steps to remove front cards from the chassis:

Note The card should slide in and out with only slight friction on the adjacent board's EMI gaskets. Do not force the card. Investigate any binding.

Each single-height front card has an extractor lever at the top of the faceplate to secure it in the card cage. Each double-height front card has an extractor lever at both the top and the bottom of the faceplate.

Caution Do not use a power screwdriver on captive screws.

Caution When extracting a front card, keep the card level until it is completely extracted from the switch. Do not allow the front cards to drop against the cards below them. This could damage components on the cards.

Step 1 Connect a grounding strap to the ESD grounding jack or to the equipment rack.

Step 2 Place the MGX 8950 switch on a flat and stable surface (for example, the floor).

Step 3 Open the front door of the switch, as necessary.

Step 4 Record the location of all of the cards before you remove them.

Step 5 Insert and press the flat-head tip of the 3-in-1 tool into the slot(s) of the extractor lever(s) at the top (and bottom) of the front card until the latch(es) springs open. Figure 5-41 shows the location of the lever slot in relation to the top of the front card.

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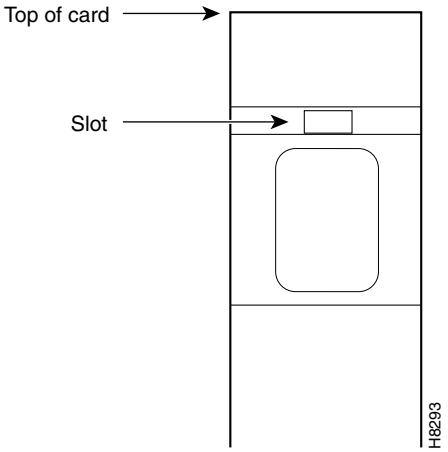
Figure 5-41 Front Card Extractor Lever



Step 6 Pull the extractor lever(s) to disconnect the front card from the midplane.

Step 7 Gently pull the front card out of the card cage. Keep the front card level and make sure that it does not hit the one beneath it.

Step 8 Place the front card in an antistatic bag or on an antistatic bench.

Step 9 Repeat Step 5 through Step 8 for each front card that you are removing from the chassis.

Remove the Back Cards

Complete the following steps to remove back cards from the chassis:

Caution Do not use a power screwdriver on captive screws.

Step 1 Record the location of all of the cards before you remove them.

Step 2 Use the flat-head or Phillips tip of the 3-in-1 tool to loosen the two captive screws located on the top and bottom of the back card faceplate.

Step 3 Pull each of the two extractor levers, located at the top and bottom of the faceplate, out to the horizontal position.

Step 4 Pull evenly on the two extractor levers to remove the back card from the card cage.

Step 5 Place the back card in an antistatic bag or on an antistatic bench.

Step 6 Repeat Step 2 through Step 5 for each back card that you are removing from the chassis.

Remove the Back Cards from an APS Assembly

Complete the following steps to remove back cards from an APS assembly and to remove the APS connector from the switch:

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Caution An APS assembly consists of two optical AXSM back cards, a primary card and a secondary card, which are connected by an APS connector (Cisco Part Number MGX-APS-CON-8950).

Caution Do not use a power screwdriver on captive screws.

Caution A rocking motion during connector mating can bend or damage the APS connector pins.

Step 1 Remove one of the back cards connected to the APS assembly.

a. Use the flat-head or Phillips tip of the 3-in-1 tool to loosen the two captive screws located on the top and bottom of the back card faceplate.

b. Pull each of the two extractor levers, located at the top and bottom of the faceplate, out to the horizontal position.

c. Pull evenly on the two extractor levers to remove the back card from the APS connector.

d. Repeat a through c for the remaining back card in the APS connector. The APS connector is still connected to the second back card when it is removed and comes out of the switch with the card.

Step 2 Carefully separate the second back card from the APS connector by pulling it out with a straight motion.

Step 3 Place the back cards and APS connector in antistatic bags or on an antistatic bench.

Step 4 Repeat through Step 3 for any remaining APS assemblies.

Install the Switch in the Rack

Caution Even with the cards removed, the weight and bulk of the card cage mandate that three or more people install it. Two installers can support and maneuver the MGX 8950 switch while a third secures it to the rack.

This section details the procedures necessary for installing the MGX 8950 switch with a mechanical lift in a 19-inch or 23-inch rack or a 19-inch cabinet.

Tip If the screw holes on the card cage are not aligned with the holes on the frame, place a flat-blade screwdriver between the card cage and fan tray to raise the card cage. Insert the screws and tighten them. Remove the screwdriver from between the fan tray and card cage.

Warning **Never attempt to lift the chassis with the handles on the power supplies, fan trays, or the switching modules. These handles are not designed to support the weight of the chassis. Using them to lift or support the chassis can result in severe damage to the equipment and serious bodily injury.** Statement 50

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Warning **Two people are required to lift the chassis. Grasp the chassis underneath the lower edge and lift with both hands. To prevent injury, keep your back straight and lift with your legs, not your back. To prevent damage to the chassis and components, never attempt to lift the chassis with the handles on the power supplies or on the interface modules. These handles were not designed to support the weight of the chassis.** Statement 5

Install the Switch in a 19-Inch or 23-Inch Rack

Complete the following steps to install the MGX 8950 switch in a 19-inch or 23-inch rack:

Step 1 Attach one mid-mounting bracket to each side of the switch before installing the unit in a rack. You need a mounting kit to accommodate a 23-inch rack (Cisco Part Number MGX-MNT23-8950).

Step 2 Have two people move the switch to the desired position in the rack, or, if spacers are used, slide the switch across the spacers and position it in the rack.

Note Maintain a gap of about 0.060 inch (1/16 inch) between units. Use a spacer if necessary.

Step 3 Use the 10-32 truss head screws to secure the switch to the mid-mounting rails.

Install the Switch in a 19-Inch Cabinet

Complete the following steps to install the MGX 8950 switch in a 19-inch cabinet:

Step 1 Have two people move the switch to the desired position in the rack, or, if spacers are used, slide the switch across the spacers and position it in the rack.

Note The rear-mounting brackets cannot be installed before you put the unit in a 19-inch cabinet

Maintain a gap of about 0.060 inch (1/16 inch) between units. Use a spacer if necessary.

Step 2 Use the 10-32 truss head screws to secure the switch to the front-mounting rails.

Step 3 Attach the rear-mounting brackets to the rack.

Step 4 Use the 10-32 truss head screws to secure the switch to the rear-mounting brackets.

Reinstall the APS Assembly

Complete the following steps to reinstall the APS assembly.

Note If you are not installing an APS assembly, go to the "Reinstall the Back Cards" section on page 5-71.

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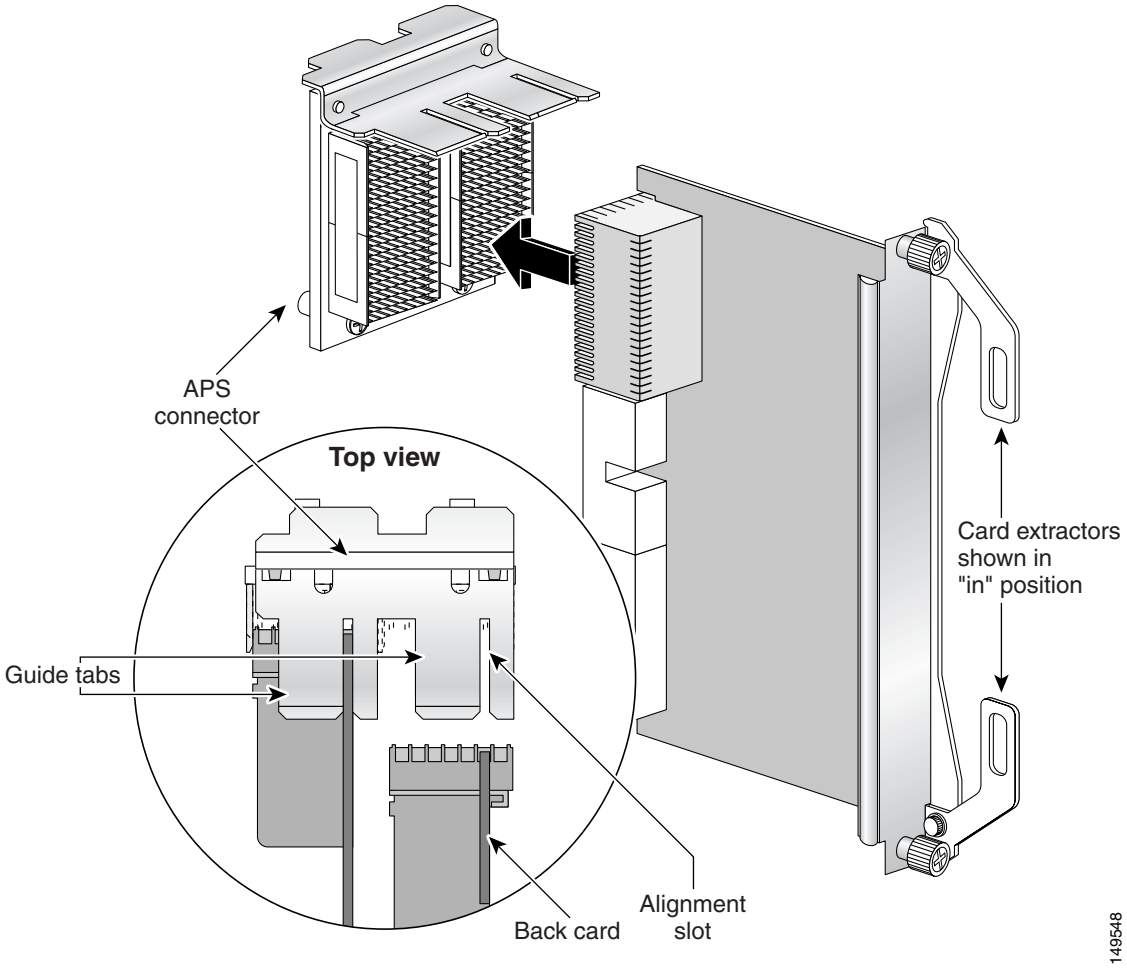
Step 1 Place the edge of the back card in the alignment slot of the APS connector (see Table 1-6 for part numbers). Use the guide tabs on the APS connector to align the holes on the back card with the pins on the APS connector. (See Figure 5-42.)

Figure 5-42 Connecting the Back Card to the MGX-APS-CON-8950 Connector



Step 2 Carefully install the back card in the APS connector by pushing firmly, with a straight motion, until the back card is securely connected

Caution A rocking motion during connector mating can bend or damage the APS connector pins.

Step 3 Repeat Step 1 and Step 2 to install a second back card in the APS connector. Figure 5-43 shows two back cards installed in the APS connector.

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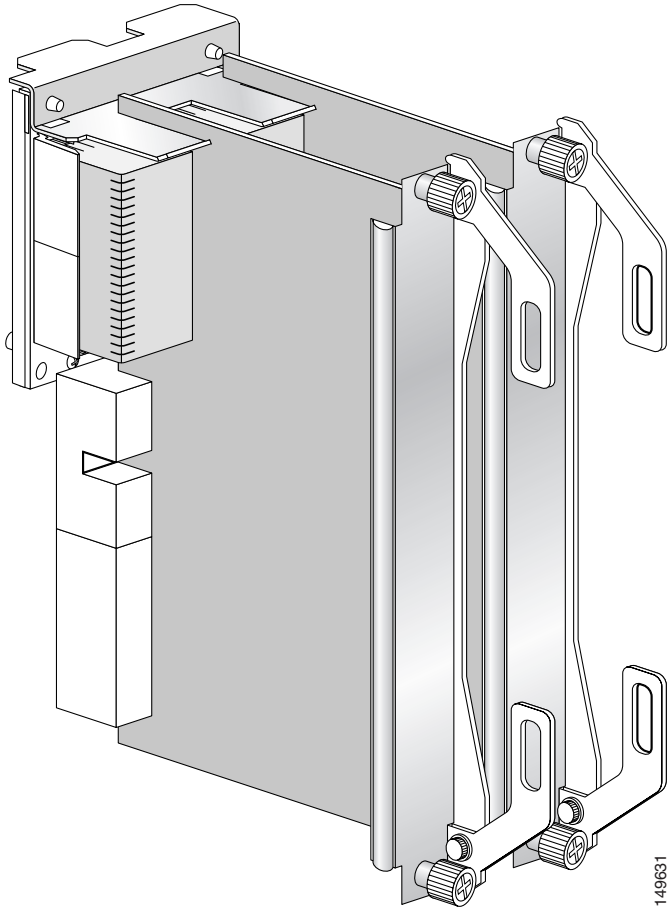
Figure 5-43 Two Back Cards in the MGX-APS-CON-8950Connector



Step 4 Position the APS assembly in the appropriate card slots.

Note The extractor levers must be closed (flush with the vertical edge of the back cards, as shown in Figure 5-13 and Figure 5-14), or the APS assembly cannot slide properly into the chassis.

Step 5 Slide the APS assembly all the way into the slot until it is properly seated in the backplane. The faceplates of the back cards are flush with the card cage when the APS assembly is properly seated.

Step 6 Tighten the captive screws on the back cards with the appropriate screwdriver. If you have difficulty inserting the captive screws, verify that the screws are aligned with the holes.

Reinstall the Back Cards

Note All cards must be fully seated in the chassis. When installing the back card, apply even pressure to the top and bottom of the faceplate to make sure that the card is fully seated.

The card should slide in and out with only slight friction on the adjacent board's EMI gaskets. Do not force the card. Investigate any binding.

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Caution To prevent damage to components on the bottom side of a card, support the faceplate and keep the card level while sliding it into the chassis.

Caution Cards must be inserted in the correct slot positions. If service module back cards are installed in the wrong slots, electrical damage can occur. If a service module back card is inserted into a PXM back card slot, damage to the card and backplane can result. If the AXSM-1-2488 or AXSM-1-2488/B front cards are installed with incorrect back cards, damage to the cards might result.

Caution If you accidentally attempt to insert a service module back card into a PXM back card slot and then have difficulty operating the chassis, examine the backplane pins and back card connector to see if they have been bent or damaged.

Caution Do not use a power screwdriver on captive screws.

Warning **Blank faceplates and cover panels serve three important functions: they prevent exposure to hazardous voltages and currents inside the chassis; they contain electromagnetic interference (EMI) that might disrupt other equipment; and they direct the flow of cooling air through the chassis. Do not operate the system unless all cards, faceplates, front covers, and rear covers are in place.** Statement 1029

Complete the following steps to reinstall a back card in the MGX 8950 switch:

Step 1 Refer to the notes you made when you recorded the location of each card to ensure that the cards are installed in the correct slots. For slot assignments for your system, refer to Table 1-3 for the MGX 8950 switch.

Step 2 See the "General Card Installation Guidelines" section on page 3-8 to verify that there are no bent pins, bent dividers, or damaged connectors on the back cards.

Step 3 Verify that the two extractor levers on the back card are in the latched position (parallel with the faceplate).

Step 4 Position the back card over the appropriate slot guides and align the back card edge with the slot guides (top and bottom) in the chassis.

Step 5 Gently apply even pressure to the top and bottom of the faceplate while pushing the back card into the slot.

Step 6 Once the back card is installed in the chassis, apply even pressure to the top and bottom of the faceplate to fully seat the back card.

Step 7 Use the flat-head or Phillips tip of the 3-in-1 tool to tighten the two captive screws on the back card faceplate.

Note Tighten the top and bottom captive screws in increments to prevent misalignment of the card. Do not overtighten the screws, but tighten them enough to secure the card.

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Step 8 Repeat Step 2 through Step 7 for each back card that you are reinstalling in the chassis.

Step 9 Install blank faceplates over any empty slots.

Reinstall the Front Cards

Note All cards must be fully seated in the chassis. When installing the front card, apply even pressure to the top and bottom of the faceplate to make sure that the card is fully seated.

The card should slide in and out with only slight friction on the adjacent board's EMI gaskets. Do not force the card. Investigate any binding.

Each single-height front card has an extractor lever at the top of the faceplate to secure it in the card cage. Each double-height front card has an extractor lever at both the top and the bottom of the faceplate.

Caution If the AXSM-1-2488 or AXSM-1-2488/B front cards are installed with incorrect back cards, damage to the cards might result.

Caution To prevent damage to components on the bottom side of a card, support the faceplate and keep the card level while sliding it into the switch.

Warning **Blank faceplates and cover panels serve three important functions: they prevent exposure to hazardous voltages and currents inside the chassis; they contain electromagnetic interference (EMI) that might disrupt other equipment; and they direct the flow of cooling air through the chassis. Do not operate the system unless all cards, faceplates, front covers, and rear covers are in place.** Statement 1029

Complete the following steps to reinstall a front card in the MGX 8950 switch:

Step 1 Refer to the notes you made when you recorded the location of each card to ensure that the cards are installed in the correct slots. For slot assignments for your system, refer to the "MGX 8950 Card Compartment" section on page 1-36.

Step 2 See the "General Card Installation Guidelines" section on page 3-8 to verify that there are no bent pins, bent dividers, or damaged connectors on the back cards.

Step 3 Verify that the extractor lever(s) are in the unlatched position.

Step 4 Position the front card over the appropriate slot and align the front card edge with the slot guides (top and bottom) in the chassis.

Step 5 Lift up and out on the extractor lever(s) and gently apply pressure to the faceplate while pushing the front card into the slot.

Step 6 Once the front card is installed in the chassis, apply even pressure to the top and bottom of the faceplate to fully seat the front card.

Step 7 Press down on the extractor lever(s) until they latch to secure the front card.

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Note Some cards have an "insertion delay latch" that needs to be raised before closing the extractor lever.

Step 8 Repeat Step 2 through Step 7 for each front card that you are reinstalling in the chassis.

Step 9 Install blank faceplates in any empty slot, as necessary.

Step 10 Close the front door on the switch, as necessary.

Install the MGX 8950 Switch with a Mechanical Lift

Note If you installed the switch using instructions in the previous section, proceed to the "Install the Upper Fan Tray" section on page 5-76.

The MGX 8950 switch is shipped with all of the ordered cards and modules installed and tested at the factory.

It is recommended that you install the MGX 8950 switch using a mechanical lift. This switch can be installed easily by a single person if a mechanical lift is used. If a mechanical lift is not available, the cards and modules must be removed so the switch can be lifted into the rack. If you are not installing the MGX 8950 switch using a mechanical lift, go to the "Install the MGX 8950 Switch without a Mechanical Lift" section on page 5-65.

When using a mechanical lift, keep the following guidelines in mind:

- The lift should be capable of handling 300 lb.
- The T & S Hefti-Lift, Model HYD-5 is a good example of the type of lift you should use. For specifications, see http://www.tseq.com/products/ergosol/hefti-lift.htm.
- Minimum platform dimensions are 17.5 inches wide by 24 inches deep.

This section details the procedures you should use to install the MGX 8950 switch with a mechanical lift in a 19-inch or 23-inch rack or a 19-inch cabinet.

- "Install the Switch in a 19-Inch or 23-Inch Rack" section on page 5-75
- "Install the Switch in a 19-Inch Cabinet" section on page 5-75

Tip If the screw holes on the card cage are not aligned with the holes on the frame, place a flat-blade screwdriver between the card cage and fan tray to raise the card cage. Insert the screws and tighten them, and then remove the screwdriver from between the fan tray and card cage.

Tip If a component requires more than two screws for installation in the rack or cabinet, install the two bottom screws first.

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Warning **Never attempt to lift the chassis with the handles on the power supplies, fan trays, or the switching modules. These handles are not designed to support the weight of the chassis. Using them to lift or support the chassis can result in severe damage to the equipment and serious bodily injury.** Statement 50

Install the Switch in a 19-Inch or 23-Inch Rack

Complete the following steps to install the MGX 8950 switch in a 19-inch or 23-inch rack:

Step 1 Attach one mid-mounting bracket to each side of the switch before installing the unit in a rack. You need a mounting kit to accommodate a 23-inch rack (Cisco Part Number MGX-MNT23-8950).

Step 2 Use a lift to raise the switch to the desired position.

Step 3 Place two spacers (about 0.060 inch [1/16 inch] thick by about 2 inches by 30 inches, fabricated from HDPE, aluminium or cardboard). One spacer should be on the left edge and one on the right edge of the switch.

Step 4 Slide the switch across the spacers and position it in the rack.

Step 5 Use the 10-32 truss head screws to secure the switch to the mid-mounting rails.

Install the Switch in a 19-Inch Cabinet

Complete the following steps to install the MGX 8950 switch in a 19-inch cabinet.

Step 1 Use a lift to raise the switch to the desired position.

Note The rear-mounting brackets cannot be installed before putting a unit in a 19-inch cabinet.

Step 2 Place two spacers (about 0.060 inch [1/16 inch] thick by about 2 inches by 30 inches, fabricated from HDPE, aluminium or cardboard). One spacer should be on the left edge and one on the right edge of the switch.

Step 3 Slide the switch across the spacers and position it in the rack.

Step 4 Use the 10-32 truss head screws to secure the switch to the front-mounting rails.

Step 5 Attach the rear-mounting brackets to the rack.

Step 6 Use the 10-32 truss head screws to secure the switch to the rear-mounting brackets.

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Install the Upper Fan Tray

Complete the following steps to install the upper fan tray.

Tip If a component requires more than two screws for installation in the rack or cabinet, install the two bottom screws first.

Step 1 If you are installing the system in a 19-inch or 23-inch rack, place the upper fan tray on a flat and stable surface (for example, a table top). Use mounting screws and a Phillips-head screwdriver to attach the mid-mounting brackets to the upper fan tray. You need a mounting kit to accommodate a 23-inch rack (Cisco Part Number MGX-MNT23-8950).

Note If you are installing the fan tray in a 19-inch cabinet, it is front-mounted in the rack with support from rear brackets.

Step 2 Position the upper fan tray, which occupies 1 RU of space, directly above the MGX 8950 switch.

Ensure that the air flow direction arrow on the back of the upper fan tray is pointing up.

Step 3 Use four mounting screws and a Phillips-head screwdriver to bolt the upper fan tray in the rack. See Figure 5-5 for the correct placement of the upper fan tray. Verify that the base at the back aligns with the top-rear edge of the card cage.

Step 4 If you are installing the fan tray in a 19-inch cabinet, attach the rear-mounting brackets to the rack, and use screws to secure the fan tray to the rear-mounting brackets.

Install the Exhaust Plenum

Complete the following steps to install the exhaust plenum.

Tip If a component requires more than two screws for installation in the rack or cabinet, install the two bottom screws first.

Step 1 If you are installing the system in a 19-inch or 23-inch rack, place the exhaust plenum on a flat and stable surface (for example, a table top). Use mounting screws and a Phillips-head screwdriver to attach the mid-mounting brackets to the exhaust plenum. You need a mounting kit to accommodate a 23-inch rack (Cisco Part Number MGX-MNT23-8950).

Note If you are installing the exhaust plenum in a 19-inch cabinet, it is front-mounted in the rack with support from rear brackets.

Step 2 Position the exhaust, which occupies 3 RUs of space, directly above the upper fan tray.

Step 3 Use four mounting screws and a Phillips-head screwdriver to bolt the exhaust plenum in the rack. See Figure 5-35 for the correct placement of the exhaust plenum.

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Step 4 If you are installing the exhaust plenum in a 19-inch cabinet, attach the rear-mounting brackets to the rack, and use screws to secure the fan tray to the rear-mounting brackets.

Install the DC PEM(s)

Warning **Before performing any of the following procedures, ensure that power is removed from the DC circuits. To ensure that all power is removed, locate the circuit breakers or fuses on the DC power lines that service the DC circuits. Turn OFF the DC power line circuit breakers and remove the DC power line fuses.** Statement 322

Warning **Before working on a system that has an On/Off switch, turn OFF the power and unplug the power cord.** Statement 1

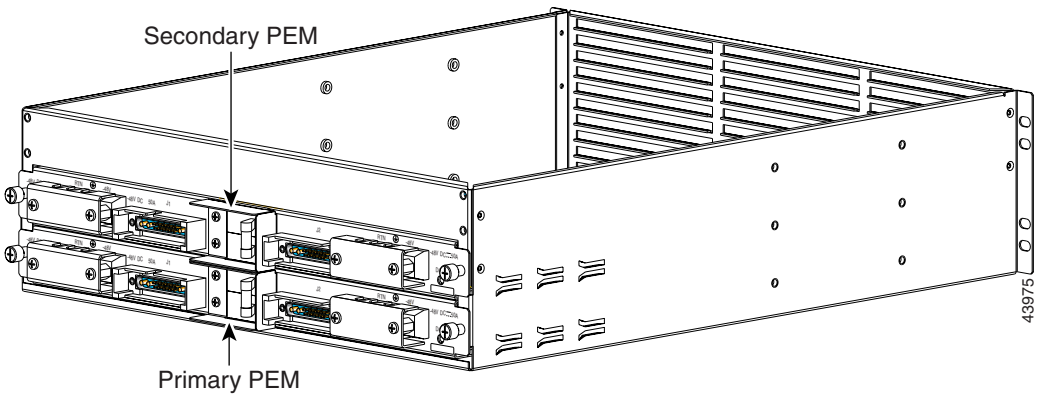
Warning **Never install an AC power module and a DC power module in the same chassis.** Statement 264

Warning **Before working on a chassis or working near power supplies, unplug the power cord on AC units; disconnect the power at the circuit breaker on DC units.** Statement 12

For a DC-powered system, install the DC PEMs at the back of the air intake plenum. Tighten the captive screws to attach the DC PEM to the component.

If you install only one DC-PEM, install it on the bottom, as viewed from the rear of the air intake plenum. (See Figure 5-44.)

Figure 5-44 DC PEMs Installed Behind the Air Intake Plenum



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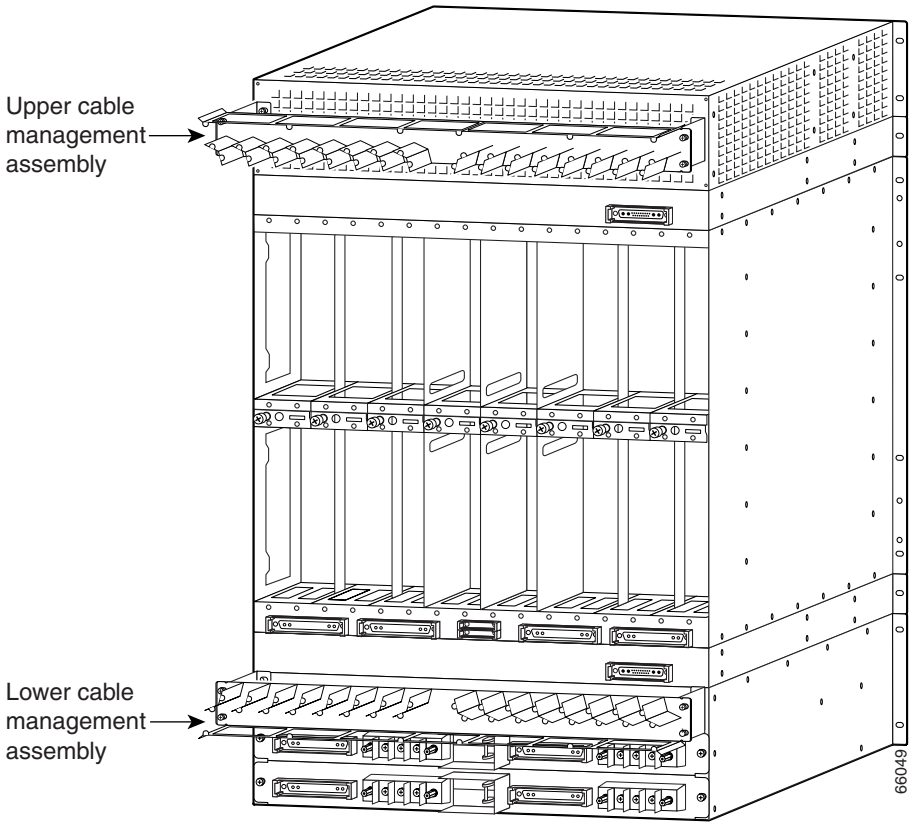
Install the Cable Management Assembly

The cable management assembly consists of two identical, horizontal cable managers, two mounting brackets, and screws. Complete the following steps to install the cable management assembly:

Step 1 Use the provided No. 10-32 screws and the appropriate screwdriver to attach the two mounting brackets to the right and left sides of the rear of the air intake and exhaust plenums.

Step 2 Use the provided No. 10-32 screws and the appropriate screwdriver to install the cable managers on the mounting brackets. The cable guides on the upper cable manager must be on the bottom. The cable guides on the lower cable manager must be on the top. See Figure 5-45.

Figure 5-45 Cable Management Assembly at Back of System



Connect the Fan Tray Power Cables to the MGX 8950 Switch

The fan trays receive power from the backplane through a fan power cable. See Figure 5-46 for an illustration of the fan power cable and Figure 5-47 for an illustration of the fan power connections.

You will need the following cables for fan cable installation:

- Cisco Systems part number 72-2083-xx (46-inch cable)
- Cisco Systems part number 72-2565-xx (12-inch cable)

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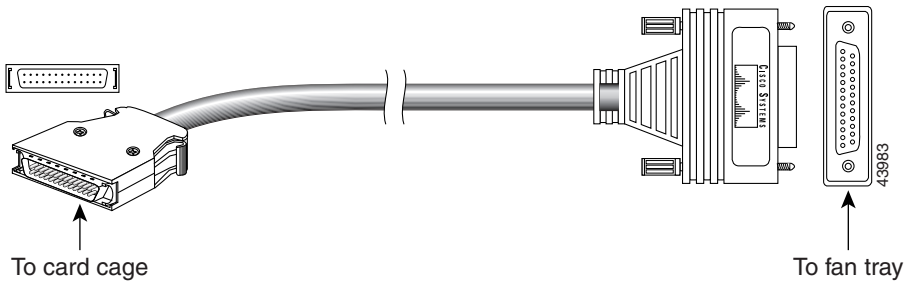
Figure 5-46 Fan Power Cable



Complete the following steps to connect the fan power cabling:

Step 1 Insert the male connector of the upper fan tray power cable (46-inch) into the connector receptacle (labeled F1) located at the bottom of the card cage, and push the connector in to seat it.

Step 2 Insert the connector at the other end of the cable into the upper fan tray receptacle as shown in Figure 5-47, and push the connector in to seat it.

Step 3 Tighten the captive screws on the connectors. Do not use a power tool.

Step 4 Insert the male connector of the lower fan tray power cable (12-inch) into the connector receptacle (labeled F2) located at the bottom of the card cage, and push the connector in to secure it.

Step 5 Insert the connector at the other end of the cable into the lower fan tray receptacle as shown in Figure 5-47, and push the connector in to secure it.

Step 6 Tighten the captive screws on the connector. Do not use a power tool.

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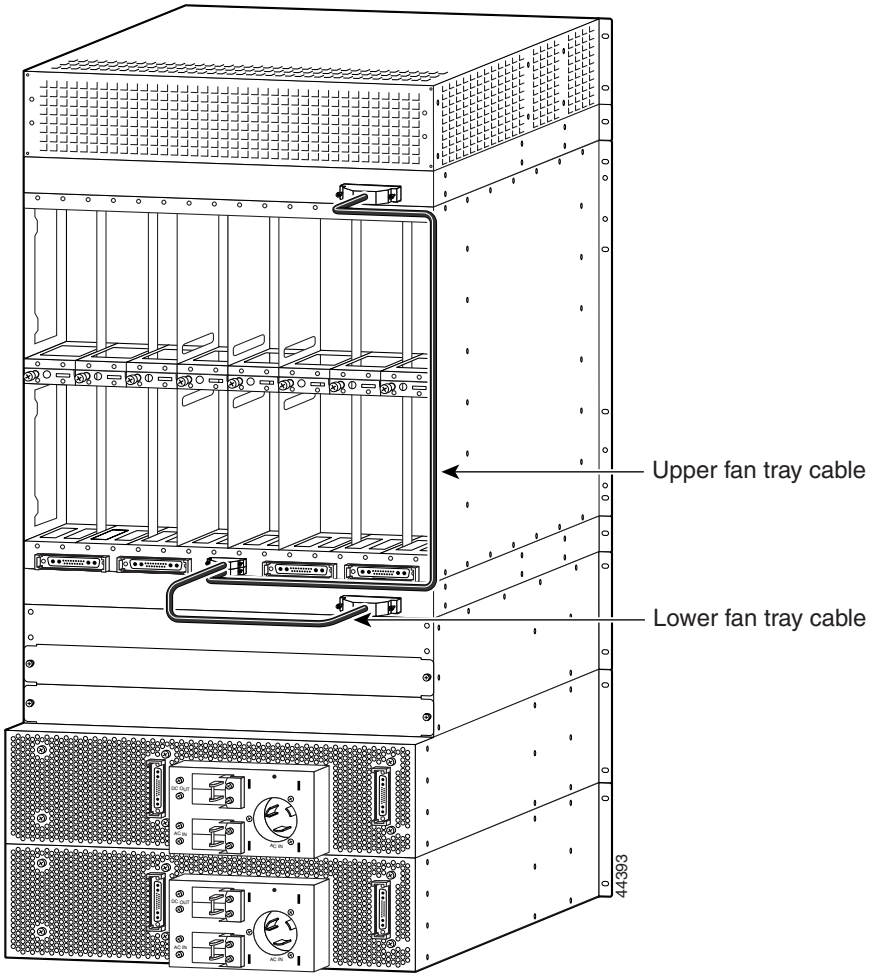
Figure 5-47 Fan Power Connections (AC-Powered Node Shown)



Connect the AC Power Supply Tray to the MGX 8950 Switch

A system power cable carries –48 VDC current from an AC power tray to the rear of the card cage (see Figure 5-48). One end of the cable plugs into the card cage in the switch and the other end of the cable plugs into the AC power supply.

If you are using AC power, complete the following steps to connect the AC power supply tray to the MGX 8950 switch. If you are using DC power, proceed to the "Connect DC Power to the Switch" section on page 5-93.

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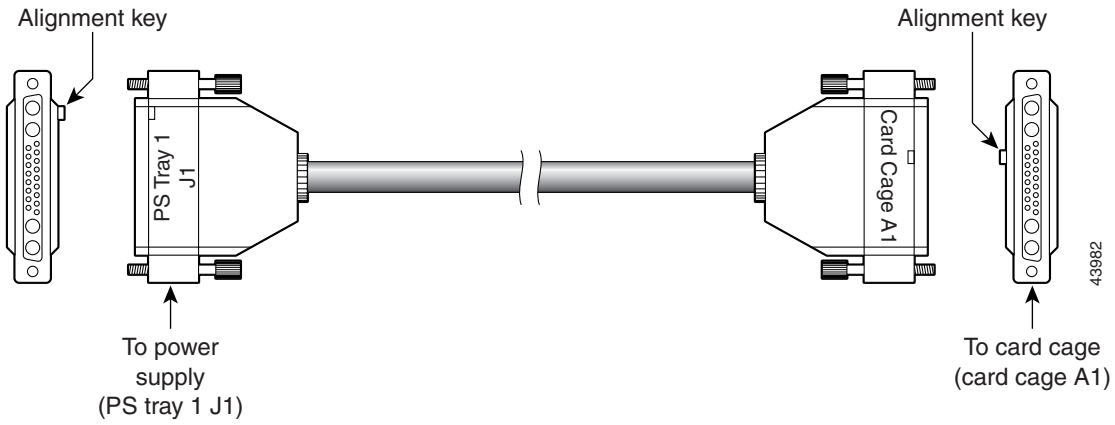
Figure 5-48 Interconnect Cable for AC



The shrouds on the AC cables and the receptacles on the card cage and power trays are keyed to ensure proper connections. Do not attempt to insert cables into shrouds that are not keyed for them.

Note The AC power interconnect cables from each tray must be connected to the backplane. If the cables are not connected, the power supply monitoring circuit will mistake this as voltage failure and will result in a tripped circuit breaker.

You will need the following cables:

- Cisco Systems part number 72-2420-XX
- Cisco Systems part number 72-2421-XX
- Cisco Systems part number 72-2422-XX
- Cisco Systems part number 72-2423-XX

See Table 5-4 and Figure 5-49 for assistance with connecting the AC power tray connectors to the card cage and power trays:

Table 5-4 AC Power Cable Connections

Cable Label	Card Cage Connect	Cable Label	Power Tray Connector
Card Cage A1	PSA 1	PS Tray 1 J1	J1 on primary (top) PS Tray
Card Cage B1	PSB 1	PS Tray 2 J1	J1 on secondary (bottom) PS Tray
Card Cage B2	PSB 2	PS Tray 2 J2	J2 on secondary PS Tray
Card Cage A2	PSA 2	PS Tray 1 J2	J2 on primary PS Tray

Note Cisco highly recommends that you install and use a redundant AC power supply.

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Perform the following procedure to install the interconnect connections for an AC-Powered Cisco MGX 8950 switch with a redundant AC power supply:

Caution Do NOT use power tools for this procedure.

Step 1 Insert the connector labeled “Card Cage A1” into the card cage receptacle labeled “PSA 1.”

Step 2 Push the connector in to seat it.

Step 3 Tighten the captive screws firmly by hand.

Step 4 Insert the other end of the cable labeled “PS Tray 1 J1” into the primary (top) AC power tray receptacle labeled “J1.”

Step 5 Push the connector in to seat it.

Step 6 Tighten the captive screws firmly by hand.

Step 7 Insert the connector labeled “Card Cage B1” into the card cage receptacle labeled “PSB 1.”

Push the connector in to seat it.

Step 8 Tighten the captive screws firmly by hand.

Step 9 Insert the other end of the cable labeled “PS Tray 2 J1” into the secondary (bottom) AC power tray receptacle labeled “J1.”

Step 10 Tighten the captive screws firmly by hand.

Step 11 Insert the connector labeled “Card Cage B2” into the card cage receptacle labeled “PSB 2.”

Push the connector in to seat it.

Step 12 Tighten the captive screws firmly by hand.

Step 13 Insert the other end of the cable labeled “PS Tray 2 J2” into the secondary AC power tray receptacle labeled “J2.”

Push the connector in to seat it.

Step 14 Tighten the captive screws firmly by hand.

Step 15 Insert the connector labeled “Card Cage A2” into the card cage receptacle labeled “PSA 2.”

Push the connector in to seat it.

Step 16 Tighten the captive screws firmly by hand.

Step 17 Insert the other end of the cable labeled “PS Tray 1 J2” into the primary AC power tray receptacle labeled “J2.”

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Figure 5-49 shows the AC Interconnect Cable Connections for Power Supply A (PSA) in Tray #1 and Power Supply B (PSB) in Tray #2.

Figure 5-49 AC Interconnect Cable Connections for Primary and Secondary Power Supplies

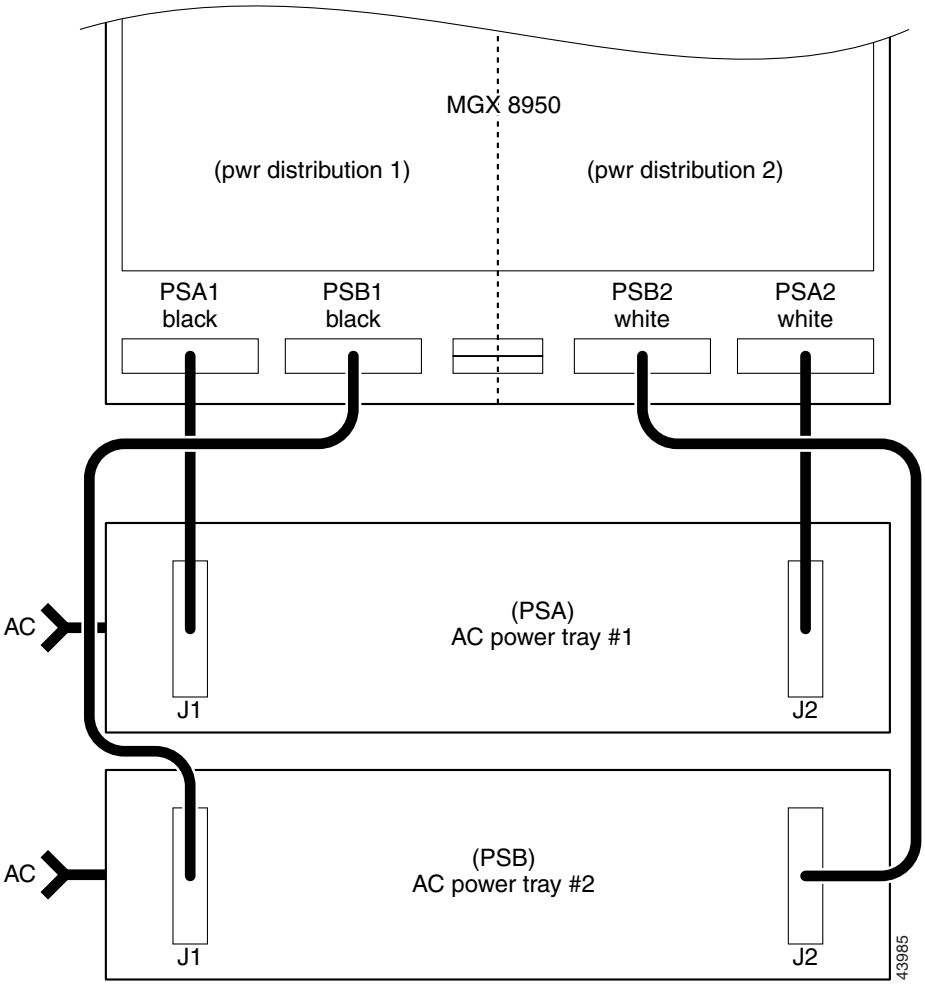

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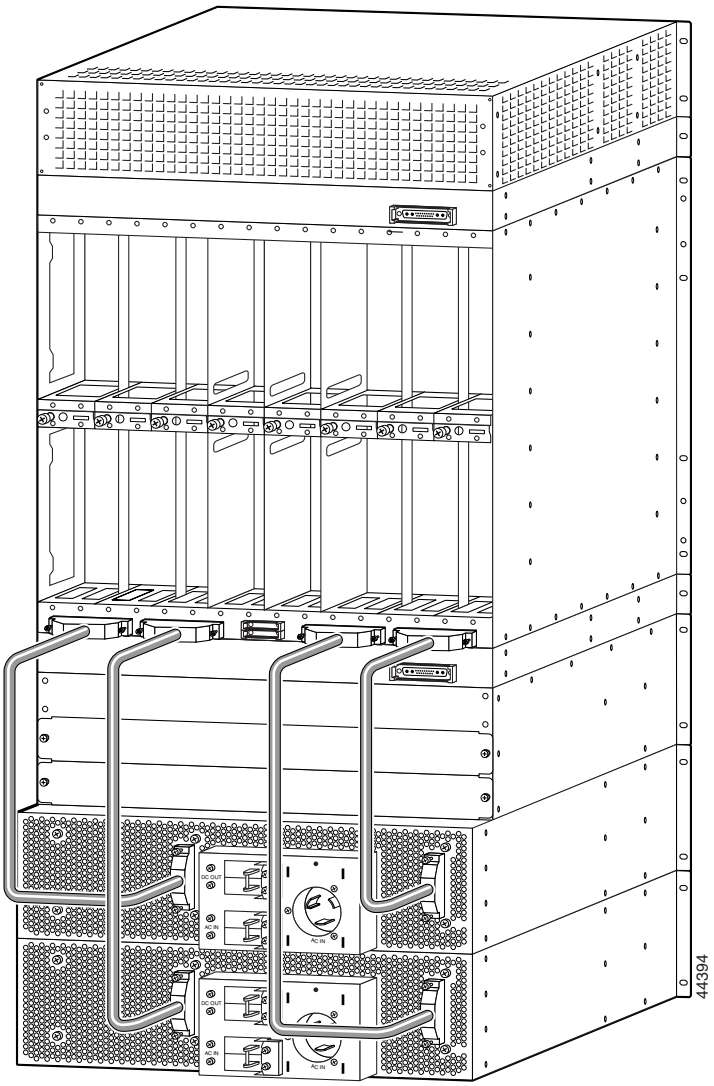
Figure 5-50 Interconnect Power Connections for AC



Connect the DC PEM to the MGX 8950 Switch

A system power cable carries –48 VDC current from a DC-PEM to the backplane (see Figure 5-51).

Caution The DC power interconnect cables from each PEM must be connected to the backplane. If the cables are not connected, the power supply monitoring circuit will mistake this as voltage failure and will result in a tripped circuit breaker.

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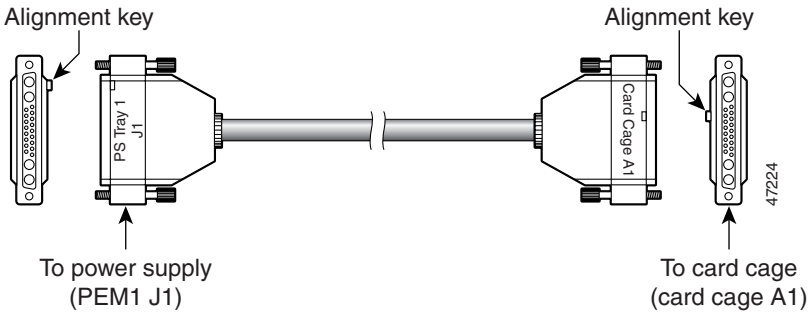
Figure 5-51 Cable Assembly for System Power



Caution The connectors on the DC cables are keyed to ensure proper cabling to the DC PEM. Improper cabling may cause damage to the system.

Figure 5-52 diagrams in detail the cabling for the DC system.

Use the following cables to install interconnect cables for DC systems:

- Cisco Systems part number 72-2424-XX
- Cisco Systems part number 72-2425-XX
- Cisco Systems part number 72-2426-XX
- Cisco Systems part number 72-2427-XX

Refer to Table 5-5 and Figure 5-52 to assist you with connecting the DC power tray connectors to the card cage:

Table 5-5 Interconnect Power Connections for DC

Cable Label	Card Cage Connection	Cable Label	PEM Connection
Card Cage A1	PSA 1	PEM 1 J1	J1 on primary (bottom) PEM
Card Cage B1	PSB 1	PEM 2 J1	J1 on secondary (top) PEM
Card Cage B2	PSB 2	PEM 2 J2	J2 on secondary PEM
Card Cage A2	PSA 2	PEM 1 J2	J2 on primary PEM

Note Cisco highly recommends that you install and use a redundant DC power supply.

Perform the following procedure to install the interconnect connections for an DC-Powered Cisco MGX 8950 switch with a redundant DC power supply:

Caution Do NOT use power tools for this procedure.

Step 1 Insert the connector labeled “Card Cage A1” into the card cage receptacle labeled “PSA 1.”

Push the connector in to seat it.

Step 2 Tighten the captive screws firmly by hand.

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Step 3 Route the cable outside the cable management brackets, then insert the other end of the cable labeled "PEM 1 J1" into the primary (bottom) PEM receptacle labelled "J1."

Push the connector in to seat it

Step 4 Tighten the captive screws firmly by hand.

Step 5 Insert the connector labeled "Card Cage B1" into the card cage receptacle labeled "PSB 1."

Push the connector in to seat it.

Step 6 Tighten the captive screws firmly by hand.

Step 7 Insert the other end of the cable labeled "PEM 2 J1" into the secondary (top) PEM receptacle labeled "J1."

Step 8 Tighten the captive screws firmly by hand.

Step 9 Insert the connector labeled "Card Cage B2" into the card cage receptacle labeled "PSB 2."

Push the connector in to seat it.

Step 10 Tighten the captive screws firmly by hand.

Step 11 Insert the other end of the cable labeled "PEM 2 J2" into the secondary (top) PEM receptacle labeled "J2."

Push the connector in to seat it.

Step 12 Tighten the captive screws firmly by hand.

Step 13 Insert the connector labeled "Card Cage A2" into the card cage receptacle labeled "PSA 2."

Push the connector in to seat it.

Step 14 Tighten the captive screws firmly by hand.

Step 15 Route cable outside the cable management system brackets, then insert the other end of the cable labeled "PEM 1 J2" into the primary (lower) PEM receptacle labeled "J2."

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Figure 5-52 shows the Interconnect Cable Connections for Power Supply A (PSA) in DC PEM Assembly (ASM) #2 and Power Supply B (PSB) in DC PEM Assembly (ASM) #1.

Figure 5-52 DC Interconnect Cable Connections (Detailed)

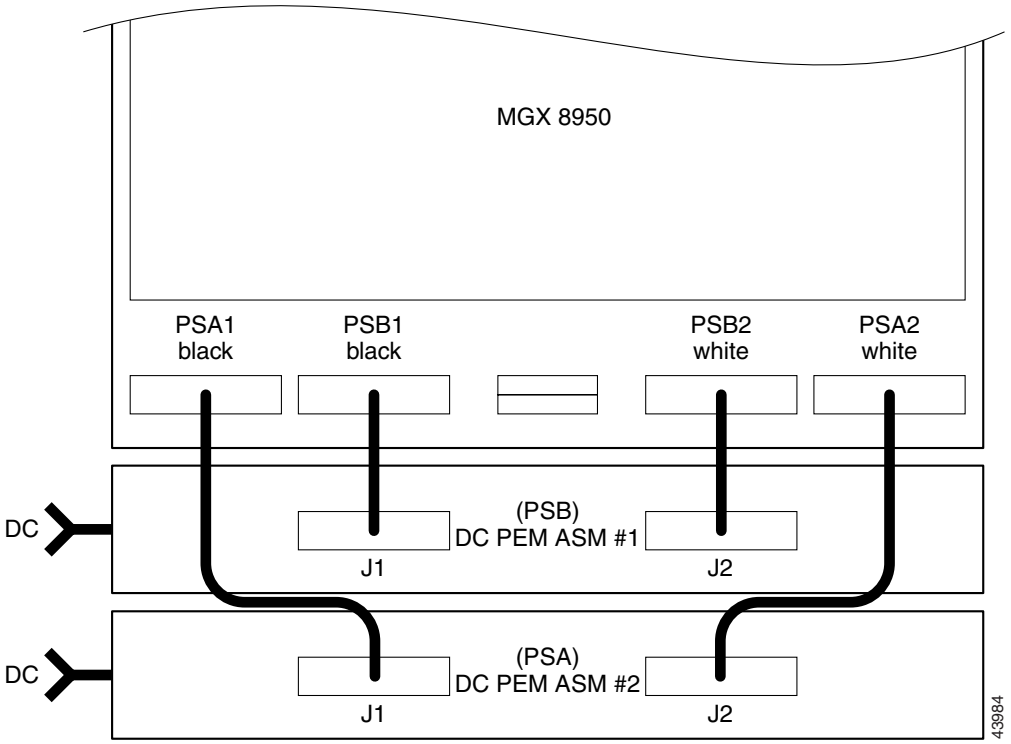

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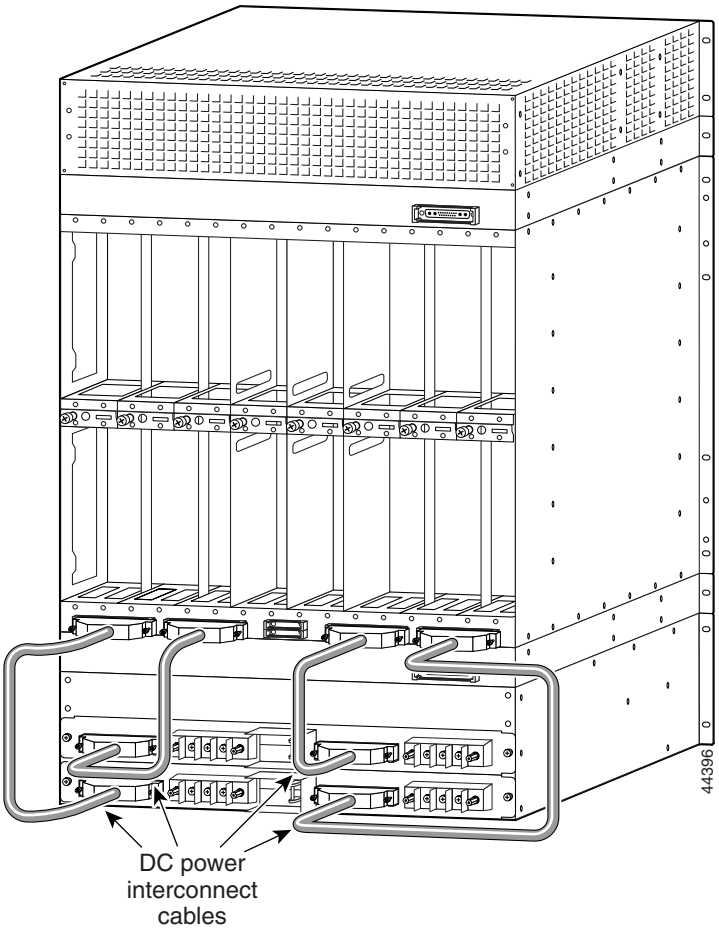
Figure 5-53 Power Interconnect Connections for DC



Connect the Back Cards

Connect the interfaces from the back cards to the appropriate end device. See Appendix B, "Cable Specifications" for cabling specifications and pinouts.

Once you have connected your back cards, route the cables through the cable management assembly. The upper card set cables run to the upper cable management panel, and the lower card set cables run to the bottom cable management panel. Figure 5-54 shows cables routed through the upper cable management panel.

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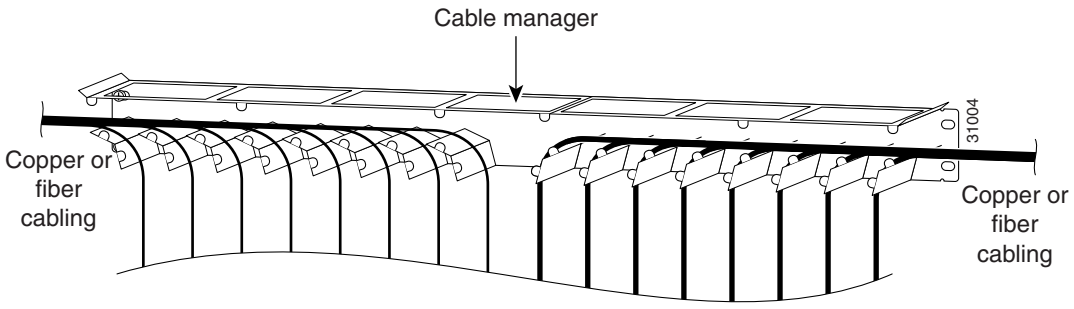
Figure 5-54 Routing Data Cables



Connect the Console Port

The command line interface (CLI) management tool allows you to configure the switch and display the switch status. When a switch starts up for the first time, the only CLI access available is through the console port (CP).

Connect a VT-100 compatible terminal to the CP on the PXM-UI-S3 or PXM-UI-S3/B. Connect the terminal to a power source and set it up using the values that are shown in Table 5-6. Figure 5-55 shows the hardware required for a CP connection.

Figure 5-55 Workstation Connection to the Console Port

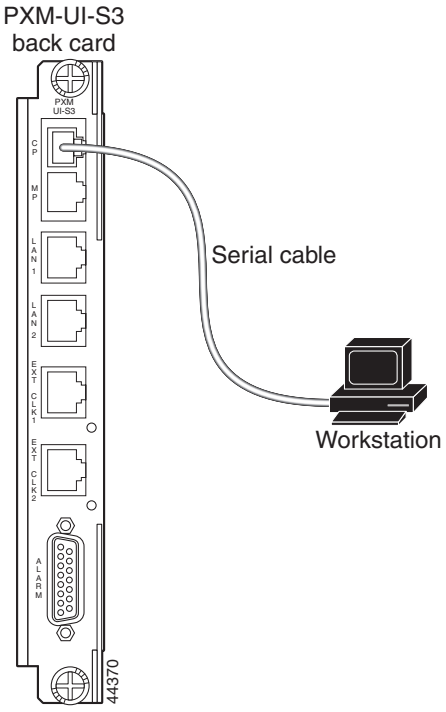


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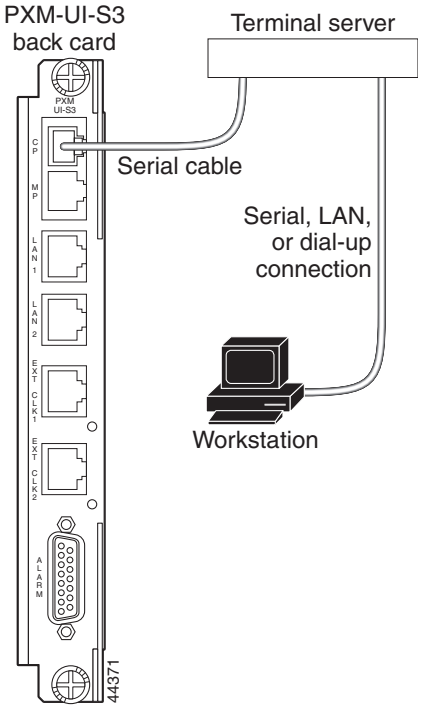
Table 5-6 Terminal Settings

Setting	Value
Baud rate	9600 bps
Character size	8 data bits
Parity	None
Stop bits	1
Hardware flow control	None

The CP connection can also be set up through a terminal server, as shown in Figure 5-56.

Figure 5-56 Terminal Server Connection to the Console Port



For further information about server management and configuration setup, refer to the appropriate software configuration guide for your switch and your release.

Connect Power to the MGX 8950 Switch

The section provides the following installation procedures for connecting power to the switch:

- "Connect AC Power to the Switch" section on page 5-91
- "Connect DC Power to the Switch" section on page 5-93

Warning **Never install an AC power module and a DC power module in the same chassis.** Statement 264

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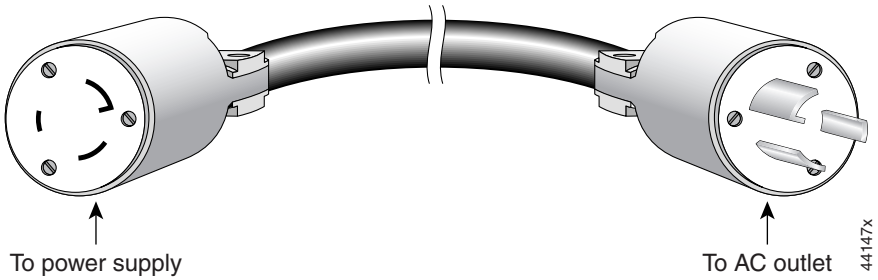
Warning **Do not touch the power supply when the power cord is connected. For systems with a power switch, line voltages are present within the power supply even when the power switch is off and if the power cord is connected. For systems without a power switch, line voltages are present within the power supply when the power cord is connected.** Statement 4

Connect AC Power to the Switch

To connect AC power to the MGX 8950 switch, use AC power cords with the following types of AC wall plugs:

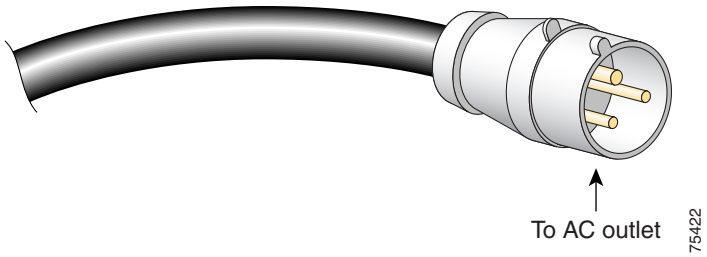
- 30A NEMA L620, 3-prong plug (North America), shown in Figure 5-57.

Figure 5-57 AC Power Cable (North America)



- 30A IEC 309 plug (Europe, Australia, New Zealand), shown in Figure 5-58.

Figure 5-58 AC Power Cable IEC 309 Plug (International)



Complete the following steps to connect a North American AC power cord to the switch:

Step 1 Insert the female connector into the AC receptacle on the AC power supply tray.

Step 2 Twist the plug to the right to secure it.

Step 3 Insert the other end of the power cable into the wall outlet.

Step 4 Repeat Step 1 through Step 3 to connect the other AC cable to the remaining AC power supply tray.

Complete the following steps to connect an international AC power cable to the switch:

Step 1 Insert the female connector into the AC power supply tray receptacle, as shown in Figure 5-59.

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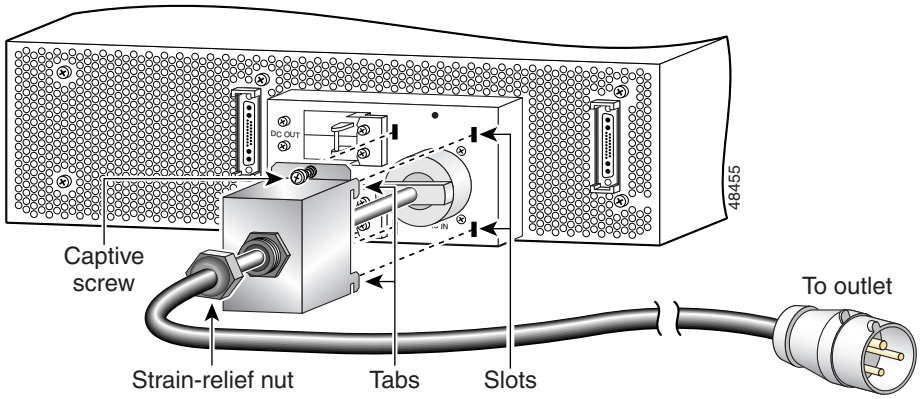
Figure 5-59 AC Power Supply Tray Cable (International)



Step 2 Twist the plug clockwise to secure.

Step 3 Loosen the nut on the black strain relief clamp and then slide the metal housing over the plug.

Step 4 Insert the metal tabs (located on both sides of the housing) into the slots found on either side of housing into receptacle and then push down on the housing to secure it.

Step 5 Tighten the thumbscrew at the top of the housing by hand.

Step 6 Tighten the nut on the strain relief to secure the cable to the housing.

Step 7 Insert the other end of the cable into the wall outlet.

Step 8 If you are using a secondary (redundant) power supply, repeat Step 1 through Step 7 for the other AC power cable.

Figure 5-60 shows the AC power connections from the back of the switch.

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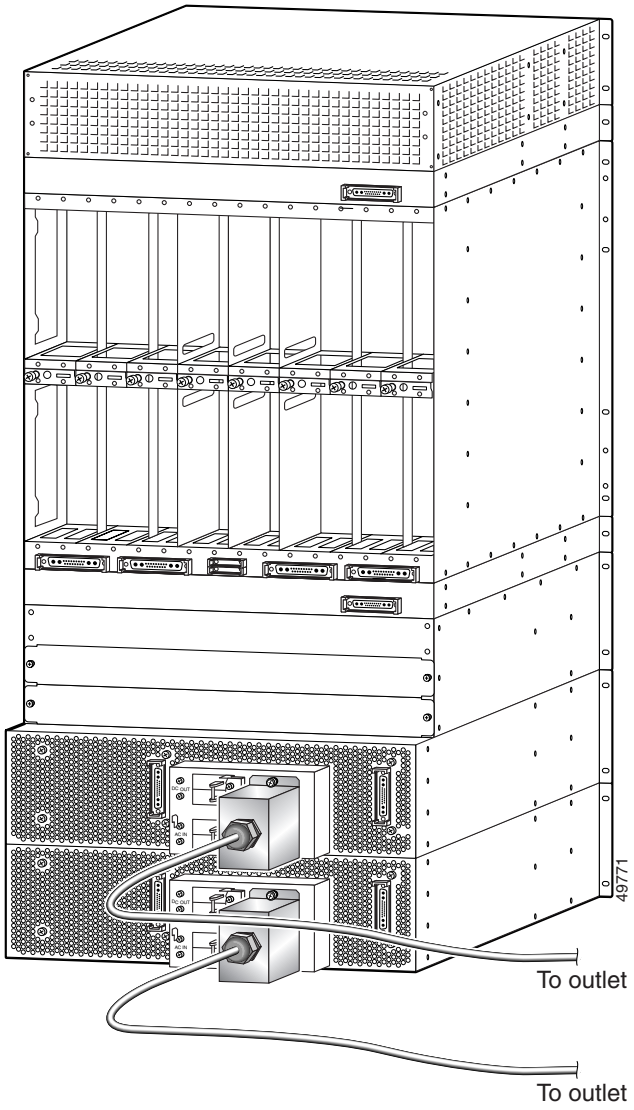
Figure 5-60 AC Power Connections (with redundant power supply)



Connect DC Power to the Switch

Complete the following steps to connect DC power to the switch:

Note Connect the MGX 8950 switch only to a –48 VDC source that complies with the Safety Extra Low Voltage (SELV) requirements in IEC 60950/EN 60950.

If you are installing redundant DC PEMs, you can connect to the same power source if you do not require the additional fault tolerance offered when using separate power sources.

Step 1 Verify that the power source to the switch is turned off and that the circuit breaker on the DC PEM is off.

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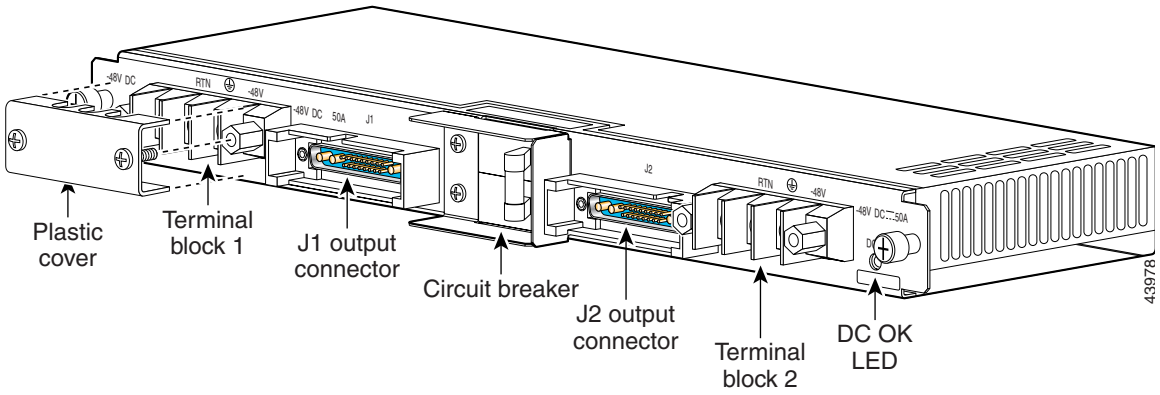
Step 2 Use a Phillips-head screwdriver to remove the two screws that hold the plastic cover over the terminal block on the DC PEM (see Figure 5-28 for location).

Figure 5-61 DC PEM



Step 3 Measure enough wire (6 AWG [10 square mm] or larger three-wire solid or stranded copper wire with insulation rating for 140°F [60°C]) to connect the DC PEM terminal block to the power source.

Note Cisco recommends using the Panduit LC AS6-10-L.

Step 4 Cut the ends of the wire so that the ends are straight, not slanted.

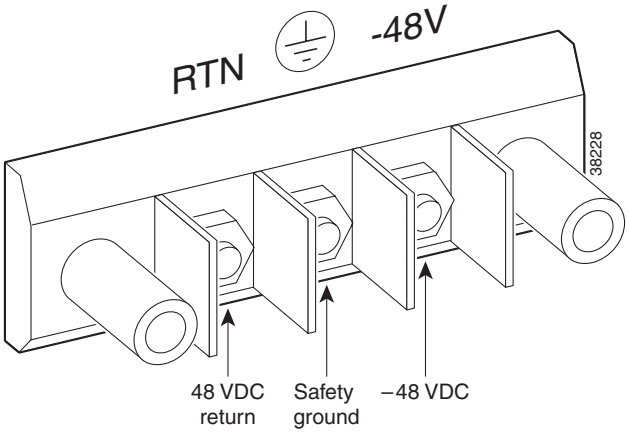
Step 5 Measure 1/4 inch (6 mm) up from one end of the wire and place a mark at that point.

Step 6 Use a wire stripper to remove 1/4 inch (6 mm) of the covering from the end of the wire. Trim the end of the covering so that it is straight, not slanted.

Step 7 Attach a ring or space lug on the end of copper wire you prepared in Step 6. The stripped part of the wire must be fully inserted so that no bare wire is exposed.

Step 8 Attach the end of the wire with the ring or space lug to the 48 VDC return, as shown in Figure 5-62.

Figure 5-62 Terminal Block on the DC PEM



Step 9 Attach the other end of the wire from Step 7 to the DC source.

Step 10 Repeat Step 3 through Step 7.

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Step 11 Attach the end of the wire (from Step 10) with the ring or space lug to the –48 VDC, as shown in Figure 5-62.

Step 12 Attach the other end of the wire from Step 10 to the DC source

Step 13 Use a Phillips-head screwdriver and two screws to attach the plastic cover over the terminal block on the DC PEM.

Step 14 Turn on the power source and turn the DC PEM power switch on

Step 15 Verify that the fans are running by listening or feeling for air movement. The following LEDs should be lit:

- AC and DC LEDs on each power supply should be green.
- DC OK LED on each DC PEM should be green.
- Status LED on the PXM45 should be green.
- Standby LED on each service module should be yellow.

Connect the External Clock

This step is optional. For information, see "Connect the External Clock" section on page B-7.

Connect the Alarms

Note This step is optional.

Dry contact relay closures are available for forwarding MGX 8950 switch alarms to an alarm system. Separate visual and audible alarm outputs are available for critical, major, and minor alarm outputs, and the outputs are provided through the use of a DB-15 connector on the PXM user interface back card (PXM-UI-S3 and PXM-UI-S3/B).

Complete the following steps to connect the external clock:

Step 1 Verify that you have a PXM-UI-S3 or PXM-UI-S3/B back card installed in slots 7 and 8 in the upper rear bay of the switch.

Step 2 Connect the DB-15 cable to the ALARM port on the PXM-UI-S3 or PXM-UI-S3/B back card.

Note See Appendix B, "Cable Specifications" for cable requirements.

Step 3 Connect the other end of the cable to the alarm source.

Connect the MP Connection

Note This step is optional.

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A dial-up connection extends switch management to all workstations that have access to the public switched telephone network (PSTN).

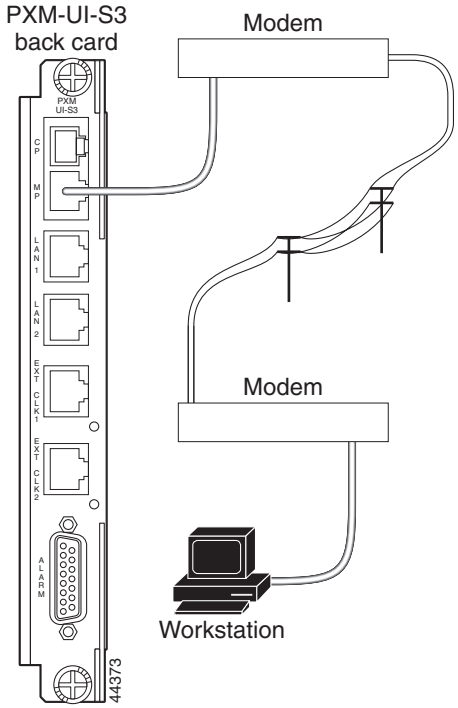
PXM-UI-S3

Connect the maintenance port (MP) on the PXM-UI-S3 card to a modem. Connect the terminal to a power source and set it up using the values that are shown in Table 5-6. This modem is connected through the PSTN and is accessible from a workstation, as shown in Figure 5-63.

PXM-UI-S3/B

A PXM-UI-S3/B card does not have a maintenance port. For the PXM-UI-S3/B card, a modem can be connected to the console port instead of the MP.

Figure 5-63 Modem Connection to the Maintenance Port



For further information about server management and configuration setup, refer to the appropriate software configuration guide for your switch and your release.

Connect the LAN1/2 Ports

Note This step is optional.

A local LAN connection extends switch management to all workstations that have connectivity to the LAN to which the switch is connected.

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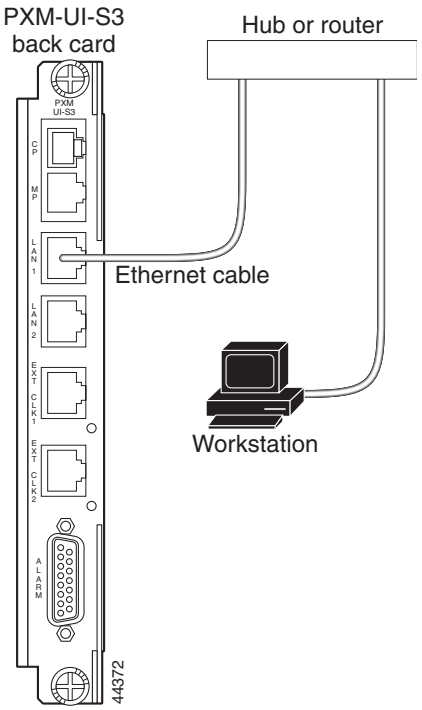
Connect the LAN 1 port on the PXM-UI-S3 or PXM-UI-S3/B to a hub or router. This hub or router is connected to a workstation, as shown in Figure 5-64.

Figure 5-64 Ethernet Connection to the LAN 1 Port



Note The LAN 2 port in Figure 5-64 is not enabled.

For further information about server management and configuration setup, refer to the appropriate software configuration guide for your switch and your release.

Verify EMI Compliance

Warning **Blank faceplates and cover panels serve three important functions: they prevent exposure to hazardous voltages and currents inside the chassis; they contain electromagnetic interference (EMI) that might disrupt other equipment; and they direct the flow of cooling air through the chassis. Do not operate the system unless all cards, faceplates, front covers, and rear covers are in place.** Statement 1029

Step 1 If your switch has an (optional) front door, verify that the door is installed and closed *and* that each empty slot is covered by a blank faceplate.

Step 2 Install the ferrite bead if needed. Refer to "Installing the Ferrite Bead on the PXM-UI-S3/B Card" section on page 5-133.

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Note Refer to the appropriate software configuration guide for your switch and your release to configure general switch features.

Installing the MGX 8830 or MGX 8830/B Switch

This section provides procedures for installing a MGX 8830 or MGX 8830/B switch in a rack or in a Cisco-supplied cabinet.

In the following procedures, *MGX 8830* refers to the MGX 8830 or the MGX 8830/B.

Caution Due to the weight of the switch, it is recommended that a mechanical lift be used to install the Cisco MGX 8830 switch in a rack.

Warning **Only trained and qualified personnel should be allowed to install or replace this equipment.** Statement 49

Warning **This unit is intended for installation in restricted access areas. A restricted access area is where access can only be gained by service personnel through the use of a special tool, lock and key, or other means of security, and is controlled by the authority responsible for the location.** Statement 37

Caution Before you begin the installation procedures, read the entire section for important information and safety warnings.

Caution Before installing and cabling the equipment, be aware of standard safety practices and the hazards involved in working with electrical circuitry to prevent accidents. See the "Safety Requirements" section on page 3-2 for cautions and warnings that are necessary to ensure a safe and hazard-free installation.

To see translations of the warnings that appear in this guide, refer to the *Regulatory Compliance and Safety Information for Cisco Multiservice Switch Products (MGX, BPX, and SES)* that shipped with your chassis.

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Installation Checklist

When you install a MGX 8830 system, be sure that you follow the installation procedures in the proper sequence. Table 5-7 is a checklist of the installation steps in the order in which they should occur. Detailed installation instructions are located in the sections following Table 5-7.

The MGX 8830 switch is shipped in one of two hardware configurations:

- Open rack—Modules and cards are shipped preinstalled in a the Cisco MGX 8830 switch and are tested according to customer specifications before they are shipped. The system is ready for installation in a customer-supplied open rack. The optional AC power supply tray, air intake plenum, upper and lower fan trays, and exhaust plenum are packaged separately and will need to be installed in the rack.

  If you are not using a mechanical lift, you will need to remove the modules and cards from the Cisco MGX 8830 switch to lessen the weight of the chassis prior to installing it in the rack. Follow the installation procedures in the "Rack-Mounted System (Without Lift)" column of Table 5-7.

  If you are using a lift to mount the MGX 8830 switch in a rack, you do not need to remove the modules, cards, and hardware components. Follow the installation procedures in the "Rack-Mounted System (with Lift)" column of Table 5-7.

- Cisco cabinet—All components are shipped preinstalled in a Cisco cabinet. Follow the installation procedures in the "Cisco Cabinet System" column of Table 5-7.

Note Using a lift to install a fully loaded MGX 8830 switch in a rack greatly simplifies the installation process, because the modules do not need to be removed from the chassis.

Before proceeding with the installation, verify that all of the ordered parts are present and in good condition. Store a record of the parts and serial numbers. If any parts are missing or damaged, contact your sales representative.

Caution Proper ESD protection is required whenever you handle Cisco equipment. Installation and maintenance personnel should be properly grounded through the use of grounding straps to eliminate the risk of ESD damage to the equipment. Modules are subject to ESD damage whenever they are removed from the chassis.

Table 5-7 Installation Checklist—MGX 8830 System

Check	Steps	Rack-Mounted System (Without Lift)	Rack-Mounted System (with Lift)	Cisco Cabinet System
	Step 1	Install Stability Plate for Seismic Anchoring		
	Step 2	Ground the Frame Bonding Ground Connection for a Cisco-Supplied Rack		
	Step 3	Measure Rack Space		Connect the AC Power Supply Tray to the Cisco MGX 8850 Switch
	Step 4	Prepare for Rack Installation		Connect the Back Cards

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Table 5-7 Installation Checklist—MGX 8830 System (continued)

Check	Steps	Rack-Mounted System (Without Lift)	Rack-Mounted System (with Lift)	Cisco Cabinet System
	Step 5	Install the AC Power Supply Tray • Remove the AC Power Supplies from the AC Power Supply Tray • Install the AC Power Supply Tray(s) • Reinstall the AC Power Supplies		Connect the Console Port
	Step 6	Install the Cisco MGX 8850 Switch without a Mechanical Lift • Prepare for Installation • Remove the Front Cards • Remove the Back Cards • Remove the Back Cards from an APS Assembly • Remove the DC PEM(s) • Install the Switch in the Rack or Cabinet • Reinstall the APS Assembly • Reinstall the Back Cards • Reinstall the DC PEM(s) • Reinstall the Front Cards	Install the Cisco MGX 8850 Switch with a Mechanical Lift • Install the Switch in a 19-Inch or 23-Inch Rack • Install the Switch in a 19-Inch Cabinet	Connect Power to the Cisco MGX 8830 Switch • Connect AC Power to the Switch • Connect DC Power to the Switch
	Step 7	Install the Cable Management Assembly		Connect the External Clock (optional)
	Step 8	Connect the AC Power Supply Tray to the Cisco MGX 8830 Switch		Connect the Alarms
	Step 9	Connect the Back Cards		Connect the MP Connection
	Step 10	Connect the Console Port		Connect the LAN1/2 Ports
	Step 11	Connect Power to the Cisco MGX 8830 Switch • Connect AC Power to the Switch • Connect DC Power to the Switch		Verify EMI Compliance
	Step 12	• Connect the External Clock (optional)		
	Step 13	• Connect the Alarms		
	Step 14	• Connect the MP Connection		
	Step 15	• Connect the LAN1/2 Ports		
	Step 16	• Verify EMI Compliance		

Note After completing these steps, proceed to the "First Time Power On Procedure for MGX Switches" section on page 5-137 if this is a first-time installation.

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Installation Procedures

Caution The switch should not receive power while you install the components.

The following sections detail the installation procedures for a MGX 8830 system:

- "Install Stability Plate for Seismic Anchoring" section on page 5-101
- "Ground the Frame Bonding Ground Connection for a Cisco-Supplied Rack" section on page 5-104
- "Measure Rack Space" section on page 5-106
- "Prepare for Rack Installation" section on page 5-107
- "Install the AC Power Supply Tray" section on page 5-108
- "Install the MGX 8830 Switch without a Mechanical Lift" section on page 5-109
- "Install the MGX 8830 Switch with a Mechanical Lift" section on page 5-118
- "Install the Cable Management Assembly" section on page 5-122
- "Connect the AC Power Supply Tray to the MGX 8830 Switch" section on page 5-122
- "Connect the Back Cards" section on page 5-124
- "Connect the Console Port" section on page 5-124
- "Connect Power to the MGX 8830 Switch" section on page 5-126
- "Connect the External Clock" section on page 5-130
- "Connect the Alarms" section on page 5-130
- "Connect the MP Connection" section on page 5-131
- "Connect the LAN1/2 Ports" section on page 5-132
- "Verify EMI Compliance" section on page 5-132

Install Stability Plate for Seismic Anchoring

You can anchor your Cisco-supplied rack or cabinet to the floor with an optional stability plate designed for seismic anchoring.

Note These instructions are specific to a Cisco-supplied cabinet, but can be used for anchoring a Cisco-supplied rack. If you are not installing your system in a Cisco-supplied rack or cabinet, anchor your third-party rack or vendor cabinet according to guidelines in the third-party vendor documentation.

The slots in the stability plate use up to 5/8-inch anchor bolts.

Caution When moving a Cisco-supplied cabinet, do not push the cabinet at its sides. Instead, grip the front or back edges of the cabinet.

Complete the following steps to anchor your Cisco cabinet to a stability plate:

Step 1 Drill holes into the floor to install the stability plate. See Figure 5-65 for the dimensions.

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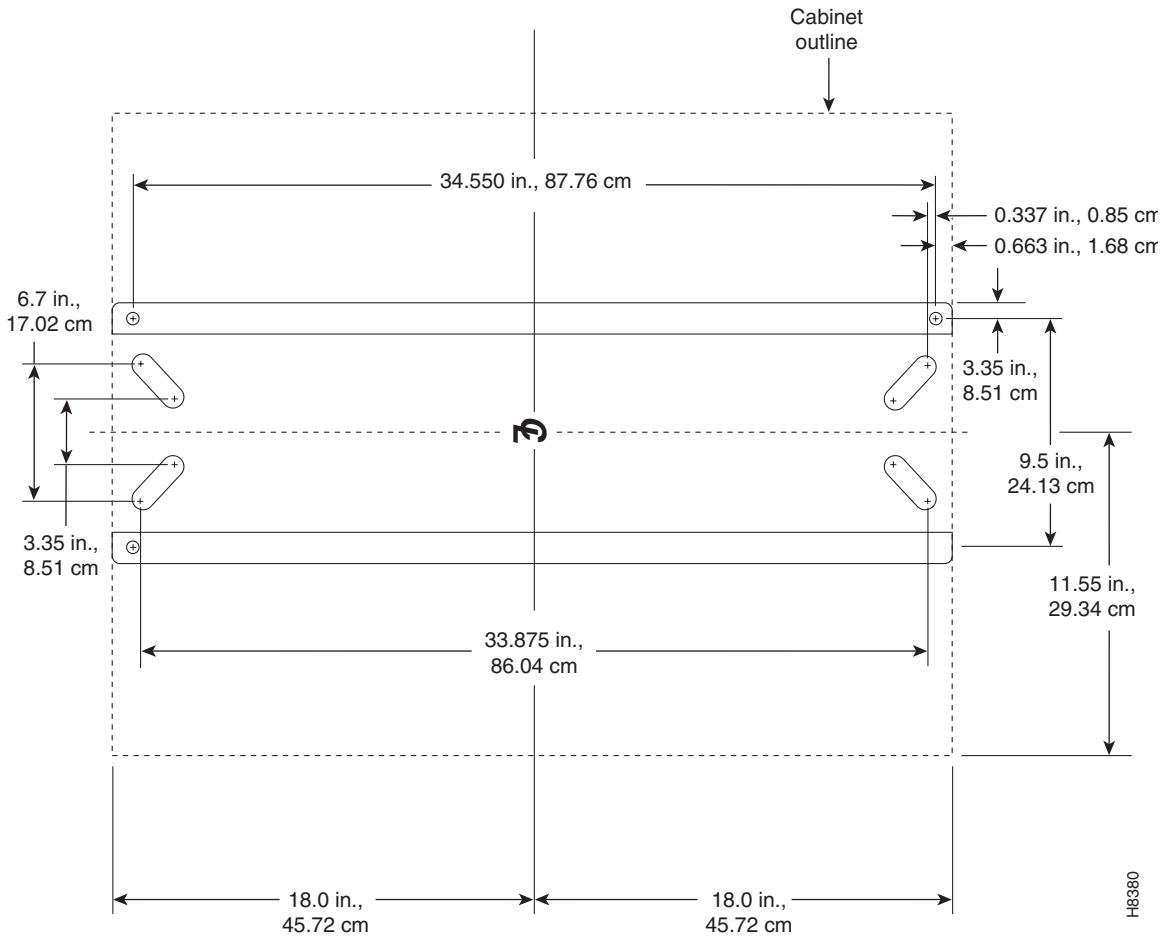
Figure 5-65 MGX 8830 Stability Plate Dimensions



Step 2 Use four 3/8 x 1 inch anchoring bolts (user-provided) to attach the stability plate to the floor.

Step 3 Roll the Cisco cabinet over the stability plate as shown in Figure 5-66.

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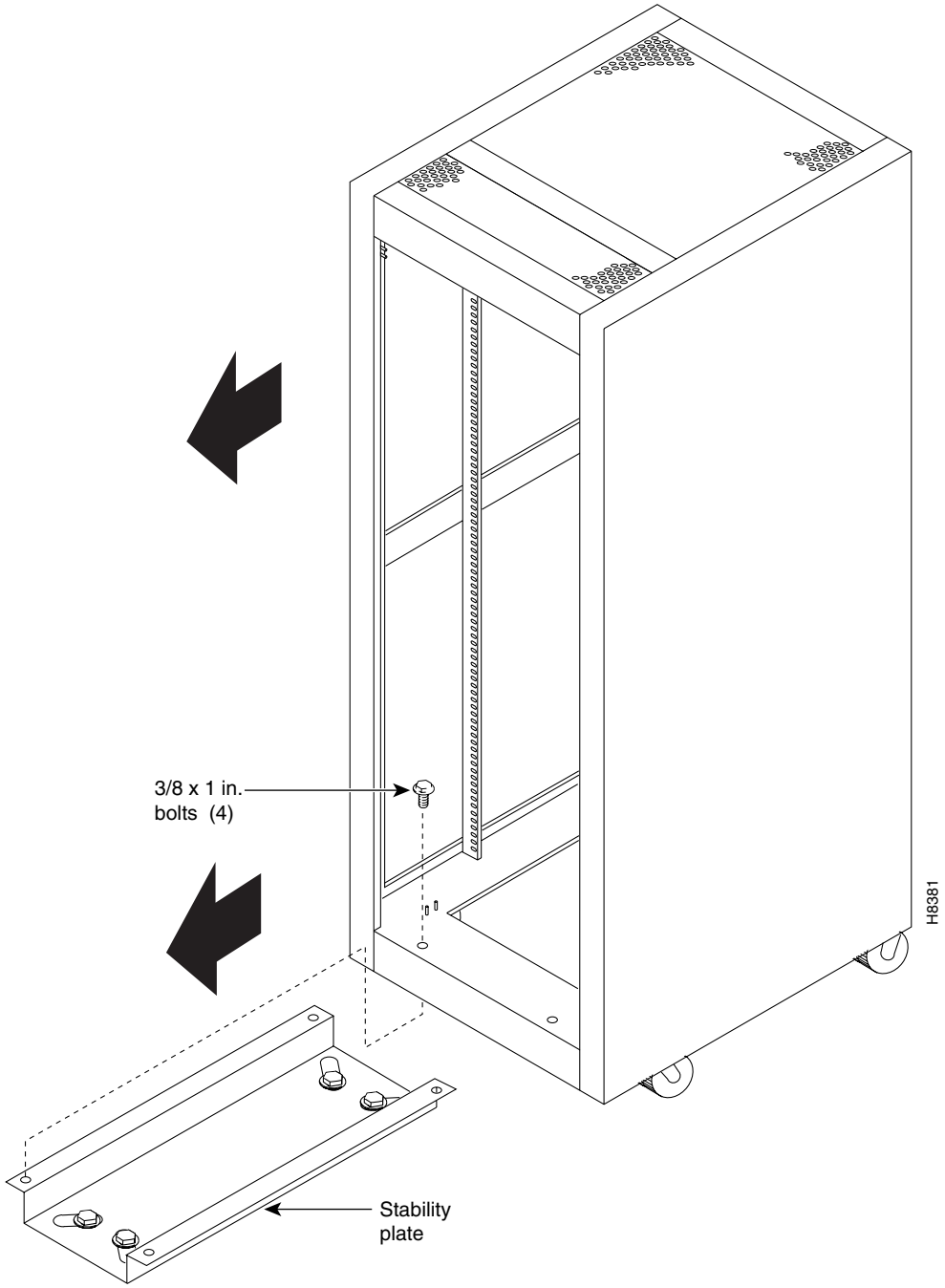
Figure 5-66 Installing a Cisco Cabinet over the Stability Plate



Step 4 Use four 3/8 x 1 inch anchoring bolts (user-provided) to secure the cabinet to the stability plate.

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Ground the Frame Bonding Ground Connection for a Cisco-Supplied Rack

A Cisco-supplied rack has two pairs of grounding studs located at the top and bottom of the rack. The rack comes with the hardware needed to secure a ground conductor to the grounding studs. The grounding studs measure 1/4 inch by 20 threads per inch. The grounding studs can accept a two-holed grounding connector designed to prevent rotation and possible loosening of the connector.

Note If you are installing your switch in a third-party vendor rack or cabinet, ensure that the rack and cabinet are properly grounded.

Caution The chassis ground wire must be the same size as the return conductor so that it can carry the entire battery load. See the "Wiring a Mixed Ground System with Redundant Supplies" section on page C-9 for more information.

Caution When moving a Cisco-supplied cabinet, do not push the cabinet at its sides. Instead, grip the front or back edges of the cabinet.

The ground conductor is typically connected to the building earth wiring, usually at a power distribution board. Complete the following steps to attach a ground conductor to the frame of a Cisco rack:

Step 1 Place the external, toothed star washers onto a stud. Figure 5-67 shows a Cisco cabinet with the frame bonding connection studs in the upper and lower parts of the cabinet. Only one of the studs is needed to make the connection. A ground symbol on the Cisco rack indicates the points of attachment.

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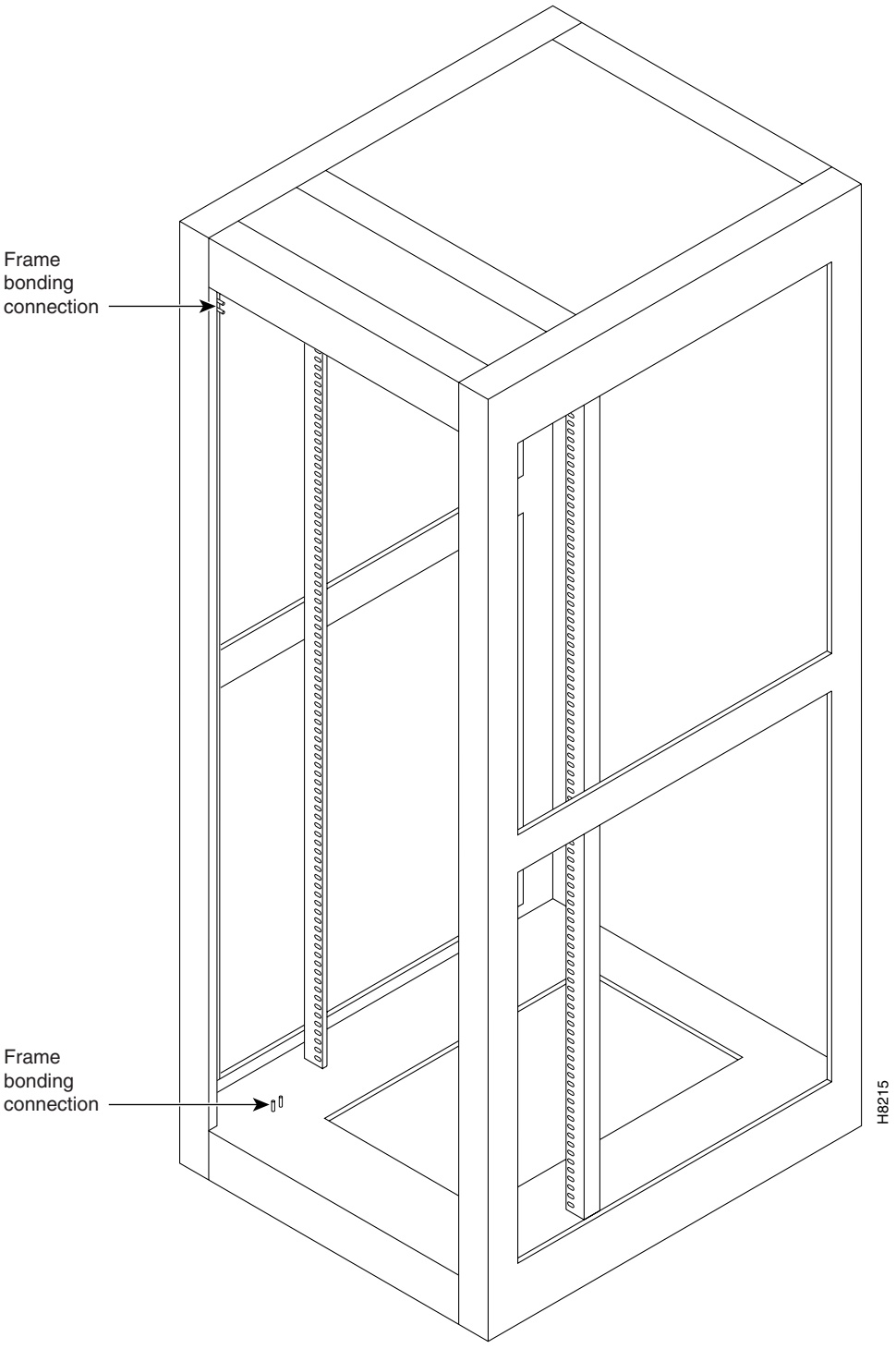
Figure 5-67 Frame Bonding Connection in Cisco-Supplied Rack



Step 2 Place the connector that terminates the grounding conductor closed-loop ring or two-hole compression fitting onto the studs.

Step 3 Place another external, toothed star washer or lock washer onto the studs.

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Step 4 Use a wrench to tighten a nut onto the threaded studs.

Measure Rack Space

Before you install the MGX 8830 switch and its related components, calculate the total rack space required to install your system. See Table 3-17 on page 3-45 for the MGX 8830 dimensions and rack units (RUs) required.

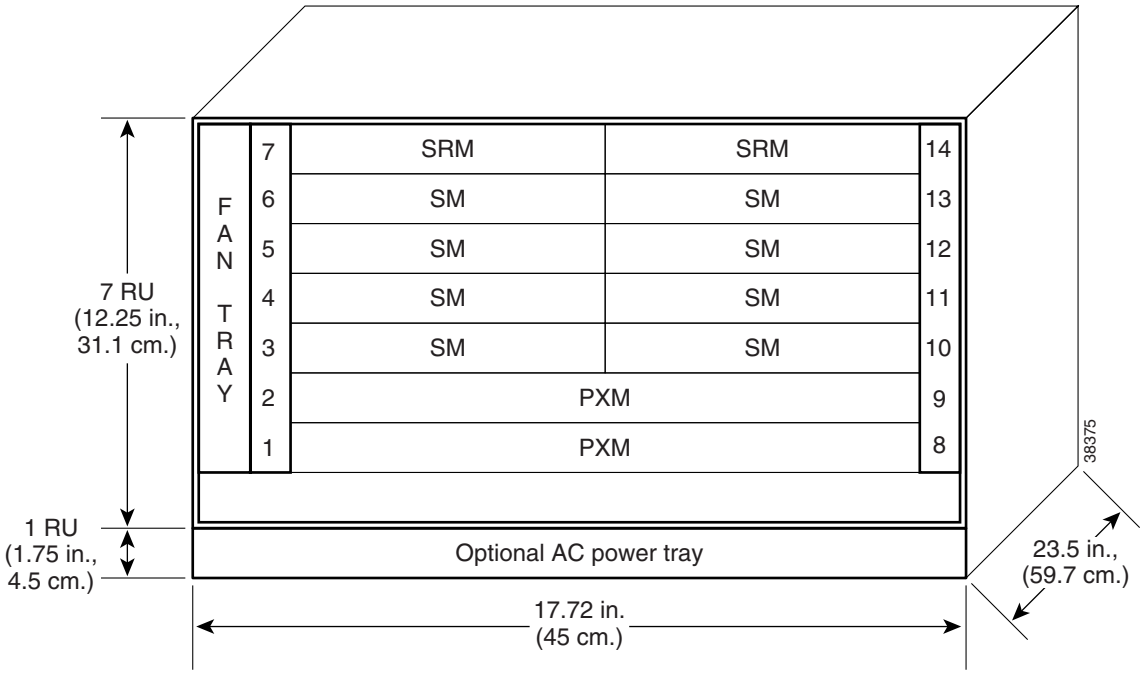
System components must be installed in the rack in the following sequence, beginning at the bottom of the rack or cabinet (see Figure 5-68):

1. AC power supply tray with power supply modules (optional)

Note If a second AC power supply tray is used (optional), install it just above the first AC power supply tray and below the air intake plenum.

2. MGX 8830 switch (with optional door)

Figure 5-68 Component Locations in a MGX 8830 System



Note If you plan to expand your system to include more switches in the future, allow space in the rack for additions, keeping in mind the weight distribution and stability of the rack

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Prepare for Rack Installation

The minimum distance between left and right mounting rails (as you face the rack) must be 17.75 inches or 45.08 cm. (Some 19-inch racks have only 17.50 inches between the rails.) The width of the components, such as the card cage and fan tray, is 17.72 inches.

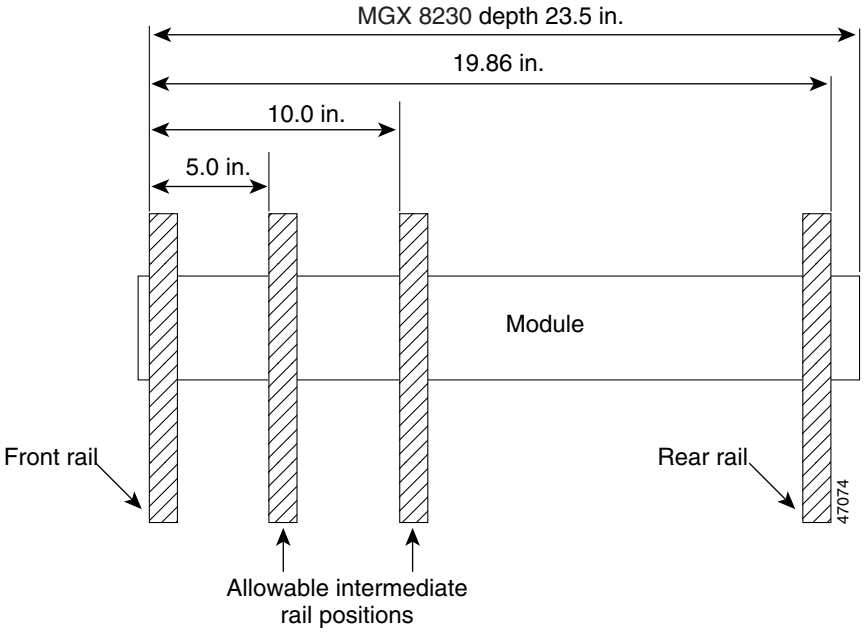
When installing a MGX 8830 system in a 19-inch rack, adhere to the following guidelines:

- Open-rack configuration—The switch and optional AC power supply tray need to be mid-mounted in the rack. Brackets for that purpose are included with the system.
- Cisco cabinet configuration—The switch and optional AC power supply tray are shipped front-mounted in the enclosure, and the rear of each component is supported by a rear bracket.

When you are installing a MGX 8830 system in a 23-inch rack, the switch and optional AC power supply tray need to be mid-mounted in the rack. You need special mounting brackets to mid-mount the components in a 23-inch rack (mounting kit, Cisco Part Number MGX-8830-MNT23).

Figure 5-69 shows the mounting rail distances for front, middle, and rear mounting rails.

Figure 5-69 Mounting Rail Distances



Tip If a component requires more than two screws for installation in the rack or cabinet, install the two bottom screws first.

Caution Make sure that mounting the equipment does not create a hazardous condition due to uneven mechanical loading. The equipment rack should be securely supported.

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Warning **To prevent bodily injury when mounting or servicing this unit in a rack, you must take special precautions to ensure that the system remains stable. The following guidelines are provided to ensure your safety:**

—This unit should be mounted at the bottom of the rack if it is the only unit in the rack.

—When mounting this unit in a partially filled rack, load the rack from the bottom to the top with the heaviest component at the bottom of the rack.

—If the rack is provided with stabilizing devices, install the stabilizers before mounting or servicing the unit in the rack. Statement 1006

Install the AC Power Supply Tray

Note AC power supply trays are optional for the MGX 8830 switch. If your system uses only DC power, proceed to either the "Install the MGX 8830 Switch without a Mechanical Lift" section on page 5-109 or the "Install the MGX 8830 Switch with a Mechanical Lift" section on page 5-118.

Tip If a component requires more than two screws for installation in the rack or cabinet, install the two bottom screws first.

Tip Do not tighten the screws completely (use about one-half turn) until all components are mounted to the rack. Otherwise, the tolerances in the screw mounting holes can go against you and make it impossible to put the screws in a piece of equipment you install later. Once all the rack-mounted components are in, tighten all of the screws.

Warning **Before working on a system that has an On/Off switch, turn OFF the power and unplug the power cord.** Statement 1

Warning **Never install an AC power module and a DC power module in the same chassis.** Statement 264

Warning **Before working on a chassis or working near power supplies, unplug the power cord on AC units; disconnect the power at the circuit breaker on DC units.** Statement 12

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Install the AC Power Supply Tray(s)

Complete the following steps to install the AC power supply tray(s).

Note MGX8830-AC= is a 1200W, 1U Power Supply. Starting with MGX Release 4, an AC-DC cable is added to allow you the option of upgrading the MGX 8830 DC system to AC. The Cisco Part Number for the MGX 8830 tray is MGX8830-AC-TRAY=.

The AC power supply modules slide into the AC power supply tray from the rear of the Cisco MGX 8830. As seen from the front of the chassis, the AC Power Supply A (PSA) is on the left and the AC Power Supply B (PSB) is on the right. The front grill of the AC power supply tray has cutouts that allow the AC OK and DC OK LEDs on the AC power supply modules (PSA and PSB) to be seen.

Note The AC power supply tray is optional.

Complete the following steps to reinstall the AC power supply modules:

Step 1 From the rear of the chassis, slide a 1200 watt AC power supply module into the AC power supply tray.

Step 2 Secure the set screw on the top of the AC power supply module to secure it in the AC power supply tray.

Step 3 Repeat Step 1 and Step 2 for the second 1200 Watt power supply module, if applicable.

Note If only one AC power supply module is used in your system, make sure that the slot for the other AC power supply module is covered with a blank faceplate.

Note For optimum performance, it is recommended that you install dual AC power systems for full redundancy.

Install the MGX 8830 Switch without a Mechanical Lift

Caution Because of the risk of damage to the cards, modules, and backplane, it is strongly recommended that a mechanical lift be used. Using a lift greatly simplifies the installation and reduces the risk of damage. See "Install the MGX 8830 Switch with a Mechanical Lift" section on page 5-118 for more information about installing the MGX 8830 switch with a mechanical lift.

If a mechanical lift is not available for installation, the switch must be manually lifted into place. Since the switch is shipped with all components preinstalled, you must remove the cards and modules from the switch so that you can lift it into the rack.

The following sections contain instructions for installing a switch without the use of a mechanical lift:

- "Prepare for Installation" section on page 5-110
- "Remove the Front Cards" section on page 5-110
- "Remove the Back Cards" section on page 5-111

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- "Remove the Back Cards from an APS Assembly" section on page 5-111
- "Remove the DC PEM(s)" section on page 5-112
- "Install the Switch in the Rack or Cabinet" section on page 5-112
- "Reinstall the APS Assembly" section on page 5-114
- "Reinstall the Back Cards" section on page 5-115
- "Reinstall the DC PEM(s)" section on page 5-117
- "Reinstall the Front Cards" section on page 5-117

Tip If a component requires more than two screws for installation in the rack or cabinet, install the two bottom screws first.

Prepare for Installation

Review the following guidelines before installation begins:

- Before removing any cards, modules, or assemblies, it is recommended that you carefully note and write down their location or slot number in the chassis.
- Verify that your ESD grounding wrist strap is properly connected. See the "Preventing ESD Damage" section on page 3-7 for detailed information about ESD procedures.

Remove the Front Cards

Complete the following steps to remove front cards from the chassis.

Note The card should slide in and out with only slight friction on the adjacent board's EMI gaskets. Do not force the card. Investigate any binding.

Each single-height front card has an extractor lever at the left of the faceplate to secure it in the card cage. Each double-height front card has an extractor lever at both the left and right of the faceplate.

Caution Do not use a power screwdriver on captive screws.

Caution When extracting a front card, keep the card level until it is completely extracted from the chassis. Do not allow the front cards to drop against the cards below them. This could damage components on the cards.

Step 1 Connect a grounding strap to the ESD grounding jack or to the equipment rack.

Step 2 Place the MGX 8830 switch on a flat and stable surface (for example, the floor).

Step 3 Open the front door of the switch, as necessary.

Step 4 Record the location of all of the cards before you remove them.

Step 5 Insert and press the flat-head tip of the 3-in-1 tool into the slot(s) of the extractor lever(s) at the left (and right) of the front card until the latch(es) springs open. Figure 5-70 shows the location of the lever slot in relation to the left side of the front card.

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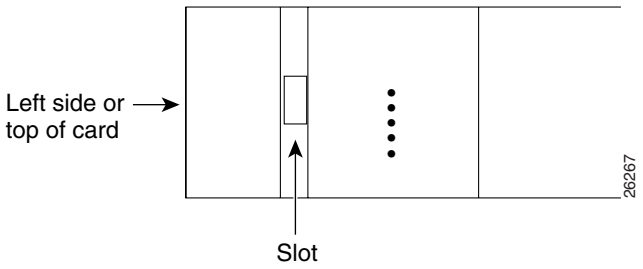
Figure 5-70 Front Card Extractor Lever



Step 6 Pull the extractor lever(s) to disconnect the front card from the midplane.

Step 7 Gently pull the front card out of the card cage. Keep the front card level and make sure that it does not hit the one beneath it.

Step 8 Place the front card in an antistatic bag or on an antistatic bench.

Step 9 Repeat Step 5 through Step 8 for each front card that you are removing from the chassis.

Remove the Back Cards

Complete the following steps to remove back cards from the chassis.

Caution Do not use a power screwdriver on captive screws.

Step 1 Record the location of all of the cards before you remove them.

Step 2 Use the flat-head or Phillips tip of the 3-in-1 tool to loosen the two captive screws located on the left and right of the back card faceplate.

Step 3 Pull each of the two extractor levers, located at the left and right of the faceplate, out to the horizontal position.

Step 4 Pull evenly on the two extractor levers to remove the back card from the card cage.

Step 5 Place the back card in an antistatic bag or on an antistatic bench.

Step 6 Repeat Step 2 through Step 5 for each back card that you are removing from the chassis.

Remove the Back Cards from an APS Assembly

Complete the following steps to remove back cards from an APS assembly and to remove the APS connector from the switch.

Note An APS assembly consists of two back cards, a primary card and a secondary card, which are connected by an APS connector (Cisco Part Number MGX-8830-APS-CON).

Caution Do not use a power screwdriver on captive screws.

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Caution A rocking motion during connector mating can bend or damage the APS connector pins.

Step 1 Remove one of the back cards connected to the APS assembly

a. Use the flat-head or Phillips tip of the 3-in-1 tool to loosen the two captive screws located on the left and right of the back card faceplate.

b. Pull each of the two extractor levers, located at the left and right of the faceplate, out to the horizontal position.

c. Pull evenly on the two extractor levers to remove the back card from the APS connector.

d. Repeat a through c for the remaining back card in the APS connector. The APS connector is still connected to the second back card when it is removed and comes out of the switch with the card.

Step 2 Carefully separate the second back card from the APS connector by pulling it out with a straight motion.

Step 3 Place the back cards and APS connector in antistatic bags or on an antistatic bench.

Step 4 Repeat through Step 3 for any remaining APS assemblies.

Remove the DC PEM(s)

Complete the following steps to remove a DC PEM from the MGX 8830 switch:

Step 1 Use the flat-head or Phillips tip of the 3-in-1 tool to loosen the two captive screws located on the DC PEM faceplate.

Step 2 Gently pull the DC PEM out of the switch.

Step 3 Repeat Step 1 and Step 2 for each DC PEM in the switch.

Install the Switch in the Rack or Cabinet

Caution Even with the cards removed, the weight and bulk of the card cage mandate that three or more people install it. Two installers can support and maneuver the MGX 8830 switch while a third secures it to the rack or cabinet.

This section details the procedures necessary for installing the MGX 8830 switch with a mechanical lift in a 19-inch or 23-inch rack or a 19-inch cabinet.

- "Install the Switch in a 19-Inch or 23-Inch Rack" section on page 5-119
- "Install the Switch in a 19-Inch Cabinet" section on page 5-121

Tip If the screw holes on the card cage are not aligned with the holes on the frame, place a flat-blade screwdriver under the card cage to raise it. Insert the screws and tighten them. Remove the screwdriver from beneath the card cage.

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Warning **Never attempt to lift the chassis with the handles on the power supplies, fan trays, or the switching modules. These handles are not designed to support the weight of the chassis. Using them to lift or support the chassis can result in severe damage to the equipment and serious bodily injury.** Statement 50

Warning **Two people are required to lift the chassis. Grasp the chassis underneath the lower edge and lift with both hands. To prevent injury, keep your back straight and lift with your legs, not your back. To prevent damage to the chassis and components, never attempt to lift the chassis with the handles on the power supplies or on the interface modules. These handles were not designed to support the weight of the chassis.** Statement 5

Install the Switch in a 19-Inch or 23-Inch Rack

Complete the following steps to install the MGX 8830 switch in a 19-inch or 23-inch rack:

Step 1 Attach one mid-mounting bracket to each side of the Cisco MGX 8830 switch before installing the unit in a rack. You need a mounting kit to accommodate a 23-inch rack (Cisco Part Number MGX-8830-MNT23).

Step 2 Have two people move the switch to the desired position in the rack, or, if spacers are used, slide the switch across the spacers and position it in the rack.

Note Maintain a gap of about 0.060 inch (1/16 inch) between units. Use a spacer if necessary.

Step 3 Use the 10-32 truss head screws to secure the switch to the mid-mounting rails.

Install the Switch in a 19-Inch Cabinet

Complete the following steps to install the MGX 8830 switch in a 19-inch cabinet:

Step 1 Have two people move the switch to the desired position in the rack, or, if spacers are used, slide the switch across the spacers and position it in the rack.

Note The rear-mounting brackets cannot be installed before you put the unit in a 19-inch cabinet.

Maintain a gap of about 0.060 inch (1/16 inch) between units. Use a spacer if necessary.

Step 2 Use the 10-32 truss head screws to secure the switch to the front-mounting rails.

Step 3 Attach the rear-mounting brackets to the rack.

Step 4 Use the 10-32 truss head screws to secure the switch to the rear-mounting brackets.

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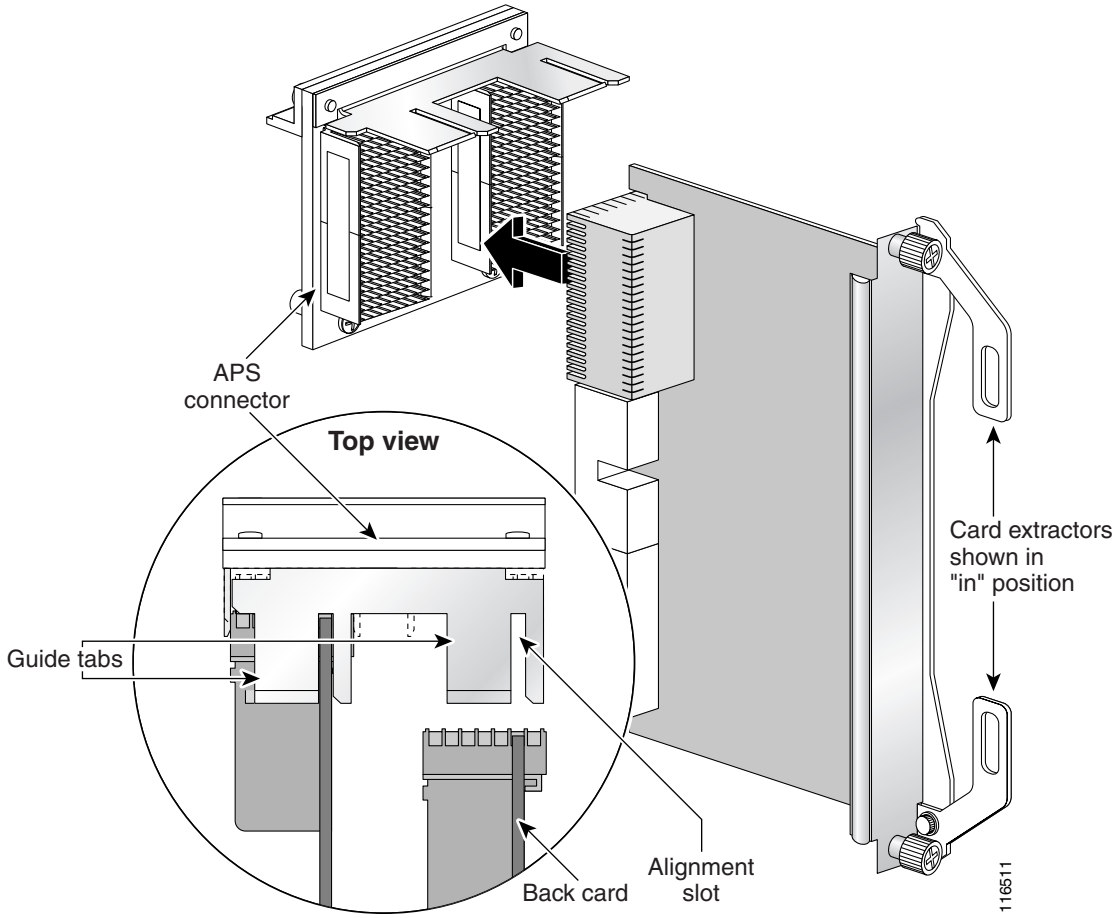
Reinstall the APS Assembly

Complete the following steps to reinstall the APS assembly.

Note If you are not installing an APS assembly, go to the "Reinstall the Back Cards" section on page 5-115.

Step 1 Place the edge of the back card in the alignment slot of the APS connector (see the Figure 5-71 for part numbers). Use the guide tabs on the APS connector to align the holes on the back card with the pins on the APS connector. (See Figure 5-71.)

Figure 5-71 Connecting the Back Card to the MGX8830-APS-CON Connector



Step 2 Carefully install the back card in the APS connector by pushing firmly, with a straight motion, until the back card is securely connected

Caution A rocking motion during connector mating can bend or damage the APS connector pins.

Step 3 Repeat Step 1 and Step 2 to install a second back card in the APS connector. Figure 5-72 shows two back cards installed in the APS connector.

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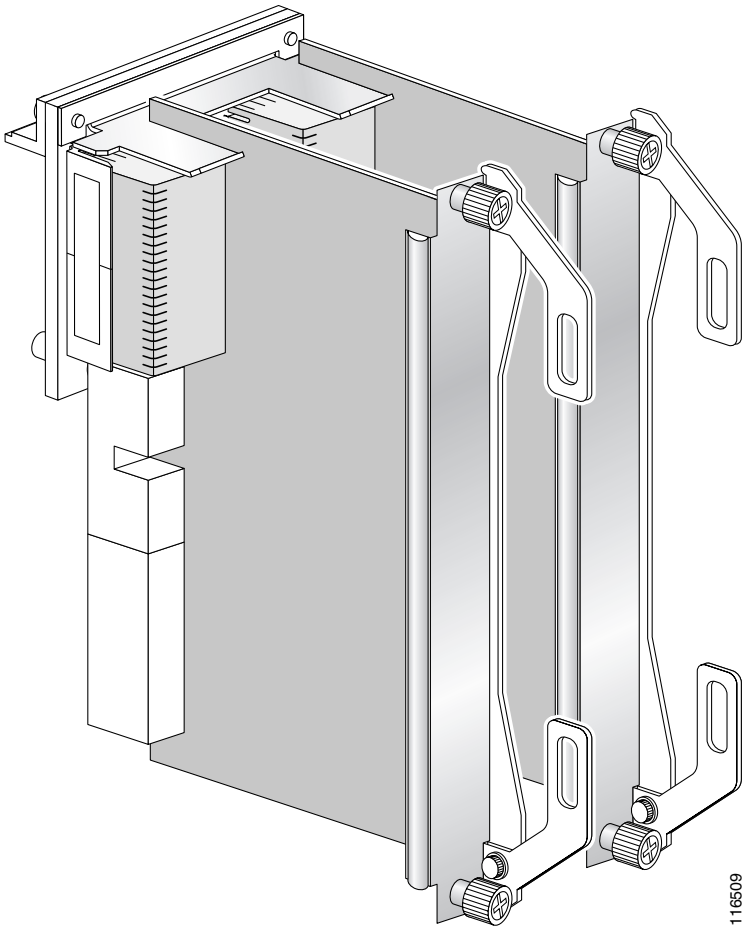
Figure 5-72 Two Back Cards in the MGX8830-APS-CON Connector



Step 4 Position the APS assembly in the appropriate card slots.

Note The extractor levers must be closed (flush with the vertical edge of the back cards, as shown in Figure 5-71 and Figure 5-72), or the APS assembly cannot slide properly into the chassis.

Step 5 Slide the APS assembly all the way into the slot until it is properly seated in the backplane. The faceplates of the back cards are flush with the card cage when the APS assembly is properly seated.

Step 6 Tighten the captive screws on the back cards with the appropriate screwdriver. If you have difficulty inserting the captive screws, verify that the screws are aligned with the holes.

Reinstall the Back Cards

Note All cards must be fully seated in the chassis. When installing the back card, apply even pressure to the left and right of the faceplate to make sure that the card is fully seated.

The card should slide in and out with only slight friction on the adjacent board's EMI gaskets. Do not force the card. Investigate any binding.

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Caution To prevent damage to components on the bottom side of a card, support the faceplate and keep the card level while sliding it into the chassis.

Caution Cards must be inserted in the correct slot positions. If service module back cards are installed in the wrong slots, electrical damage can occur. If a service module back card is inserted into a PXM back card slot, damage to the card and backplane can result.

Caution If you accidentally attempt to insert a service module back card into a PXM back card slot and then have difficulty operating the chassis, examine the backplane pins and back card connector to see if they have been bent or damaged.

Caution Do not use a power screwdriver on captive screws.

Warning **Blank faceplates and cover panels serve three important functions: they prevent exposure to hazardous voltages and currents inside the chassis; they contain electromagnetic interference (EMI) that might disrupt other equipment; and they direct the flow of cooling air through the chassis. Do not operate the system unless all cards, faceplates, front covers, and rear covers are in place.** Statement 1029

Complete the following steps to reinstall a back card in the MGX 8830 switch:

Step 1 Refer to the notes you made when you recorded the location of each card to ensure that the cards are installed in the correct slots. For slot assignments for your system, refer to the "MGX 8830 Card Compartment" section on page 1-48.

Step 2 See the "General Card Installation Guidelines" section on page 3-8 to verify that there are no bent pins, bent dividers, or damaged connectors on the back cards.

Step 3 Verify that the two extractor levers on the back card are in the latched position (parallel with the faceplate).

Step 4 Position the back card over the appropriate slot guides and align the back card edge with the slot guides (left and right) in the chassis.

Step 5 Gently apply even pressure to the sides of the faceplate while pushing the back card into the slot.

Step 6 Once the back card is installed in the chassis, apply even pressure to the sides of the faceplate to fully seat the back card.

Step 7 Use the flat-head or Phillips tip of the 3-in-1 tool to tighten the two captive screws on the back card faceplate.

Note Tighten the left and right captive screws in increments to prevent misalignment of the card. Do not overtighten the screws, but tighten them enough to secure the card.

Step 8 Repeat Step 2 through Step 7 for each back card that you are reinstalling in the chassis.

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Step 9 Install blank faceplates over any empty slots.

Reinstall the DC PEM(s)

Complete the following steps to reinstall a DC PEM in the MGX 8830 switch:

Step 1 Position the DC PEM edges over the appropriate guides at the left and right sides of the card cage.

Step 2 Gently slide the DC PEM all the way into the slot and push to seat the DC PEM.

Step 3 Use the flat-head or Phillips tip of the 3-in-1 tool to tighten the two captive screws located on the DC PEM faceplate.

Note Tighten the right and left captive screws in increments to prevent misalignment of the card. Do not overtighten the screws, but secure the card.

Step 4 Verify that the DC PEM circuit breaker is OFF.

Step 5 Repeat Step 1 and Step 4 for each DC PEM in the chassis.

Reinstall the Front Cards

Note All cards must be fully seated in the chassis. When installing the front card, apply even pressure to the left and right of the faceplate to make sure that the card is fully seated.

The card should slide in and out with only slight friction on the adjacent board's EMI gaskets. Do not force the card. Investigate any binding.

Each single-height front card has an extractor lever at the left of the faceplate to secure it in the card cage. Each double-height front card has an extractor lever at both the left and right of the faceplate.

Caution To prevent damage to components on the bottom side of a card, support the faceplate and keep the card level while sliding it into the chassis.

Warning **Blank faceplates and cover panels serve three important functions: they prevent exposure to hazardous voltages and currents inside the chassis; they contain electromagnetic interference (EMI) that might disrupt other equipment; and they direct the flow of cooling air through the chassis. Do not operate the system unless all cards, faceplates, front covers, and rear covers are in place.** Statement 1029

Complete the following steps to reinstall a front card in the MGX 8830 switch:

Step 1 Refer to the notes you made when you recorded the location of each card to ensure that the cards are installed in the correct slots. For slot assignments for your system, refer to the"MGX 8830 Card Compartment" section on page 1-48.

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Step 2 See the "General Card Installation Guidelines" section on page 3-8 to verify that there are no bent pins, bent dividers, or damaged connectors on the back cards.

Step 3 Verify that the extractor lever(s) are in the unlatched position.

Step 4 Position the front card over the appropriate slot and align the front card edge with the slot guides (left and right) in the chassis.

Step 5 Lift up and out on the extractor lever(s) and gently apply pressure to the faceplate while pushing the front card into the slot.

Step 6 Once the front card is installed in the chassis, apply even pressure to the sides of the faceplate to fully seat the front card.

Step 7 Press down on the extractor lever(s) until they latch to secure the front card.

Note Some cards have an "insertion delay latch" that needs to be raised before closing the extractor lever.

Step 8 Repeat Step 2 through Step 7 for each front card that you are reinstalling in the chassis.

Step 9 Install blank faceplates in any empty slot, as necessary.

Step 10 Close the front door on the switch, as necessary.

Install the MGX 8830 Switch with a Mechanical Lift

Note If you installed the switch using instructions in the previous section, proceed to the "Install the Cable Management Assembly" section on page 5-122.

The MGX 8830 switch is shipped with all of the ordered cards and modules installed and tested at the factory.

It is recommended that you install the MGX 8830 switch using a mechanical lift. This switch can be installed easily by a single person if a mechanical lift is used. If a mechanical lift is not available, the cards and modules must be removed so that the switch can be lifted into the rack. If you are not installing the MGX 8830 switch using a mechanical lift, go to the "Install the MGX 8830 Switch without a Mechanical Lift" section on page 5-109.

When using a mechanical lift, keep the following guidelines in mind:

- The lift should be capable of handling 300 lb.
- The T & S Hefti-Lift, Model HYD-5 is a good example of the type of lift you should use. For specifications, see http://www.tseq.com/products/ergosol/hefti-lift.htm.
- Minimum platform dimensions are 17.5 inches wide by 24 inches deep.

This section details the procedures you should use to install the MGX 8830 switch with a mechanical lift in a 19-inch or 23-inch rack or a 19-inch cabinet.

- "Install the Switch in a 19-Inch or 23-Inch Rack" section on page 5-119
- "Install the Switch in a 19-Inch Cabinet" section on page 5-121

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Tip If the screw holes on the card cage are not aligned with the holes on the frame, place a flat-blade screwdriver between the card cage and fan tray to raise the card cage. Insert the screws and tighten them, and then remove the screwdriver from between the fan tray and card cage.

Tip If a component requires more than two screws for installation in the rack or cabinet, install the two bottom screws first.

Warning **Never attempt to lift the chassis with the handles on the power supplies, fan trays, or the switching modules. These handles are not designed to support the weight of the chassis. Using them to lift or support the chassis can result in severe damage to the equipment and serious bodily injury.** Statement 50

Install the Switch in a 19-Inch or 23-Inch Rack

Complete the following steps to install the MGX 8830 switch in a 19-inch or 23-inch rack:

Step 1 Attach one mid-mounting bracket to each side of the Cisco MGX 8830 switch before installing the unit in a rack.

Note You need a mounting kit to accommodate a 23-inch rack (Cisco Part Number MGX-8830-MNT23).

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Figure 5-73 shows the mid-mounting brackets attached to the switch for a 19-inch rack.

Figure 5-73 Front View with the Mid-Mounting Brackets Attached—19-Inch Rack

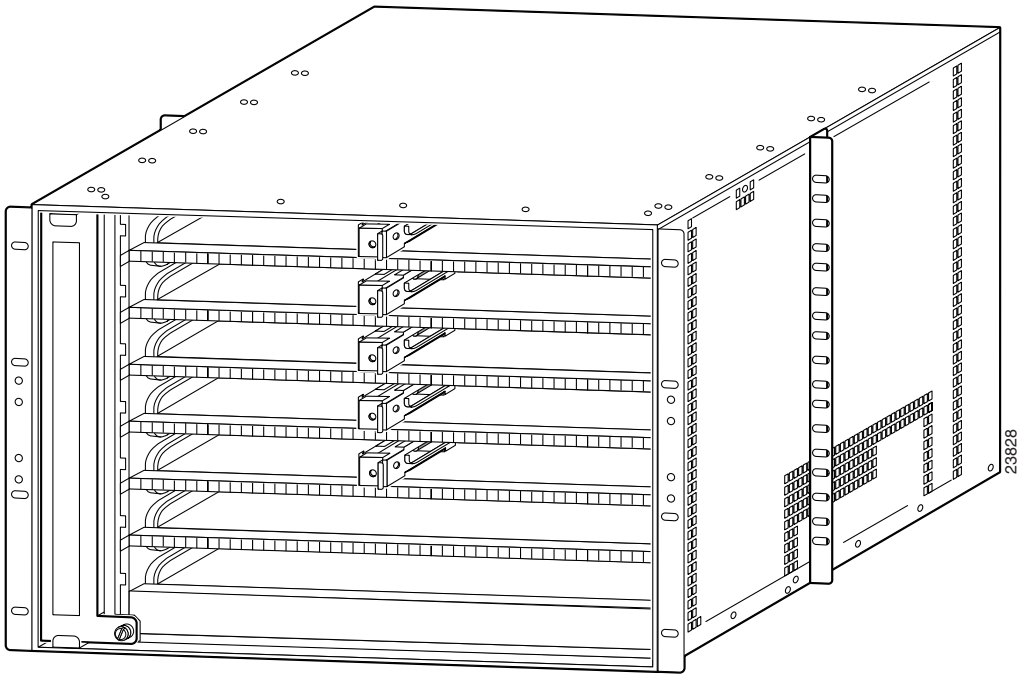
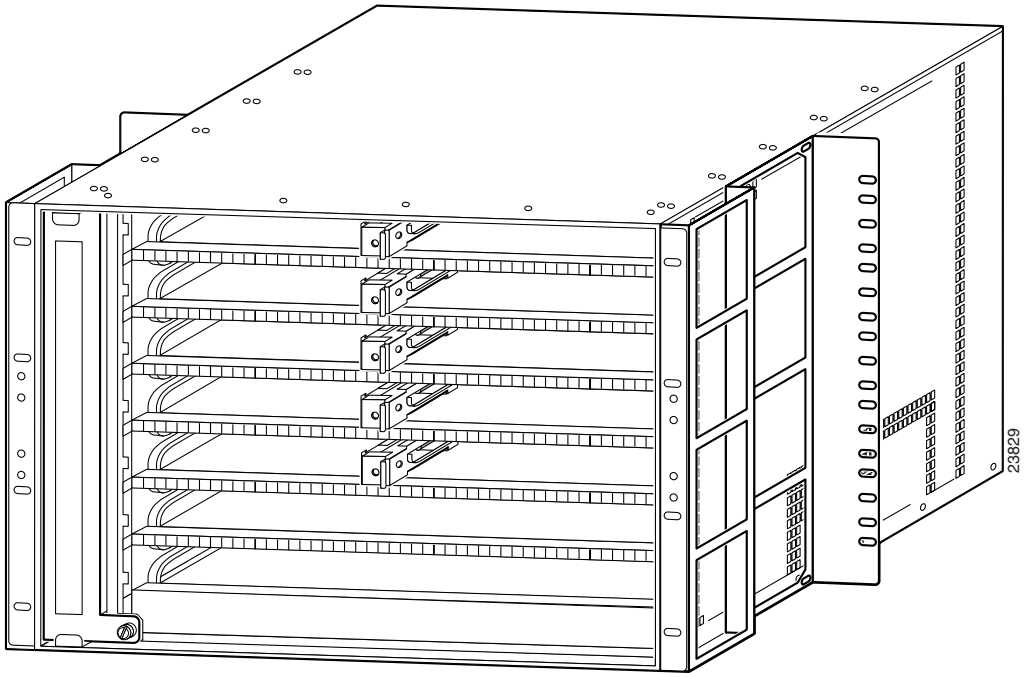


Figure 5-74 shows the mid-mounting brackets attached to the switch for a 23-inch rack.

Figure 5-74 Front View with the Mid-Mounting Brackets Attached—23-Inch Rack



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Step 2 Use a lift to raise the switch to the desired position.

Step 3 Place two spacers (about 0.060 inch [1/16 inch] thick by about 2 inches by 30 inches, fabricated from HDPE, aluminium or cardboard). One spacer should be on the left edge and one on the right edge of the switch.

Step 4 Slide the switch across the spacers and position it in the rack.

Step 5 Use the 10-32 truss head screws to secure the switch to the mid-mounting rails.

Install the Switch in a 19-Inch Cabinet

Complete the following steps to install the MGX 8830 switch in a 19-inch cabinet:

Step 1 Use a lift to raise the switch to the desired position.

Note The rear-mounting brackets cannot be installed before putting a unit in a 19-inch cabinet.

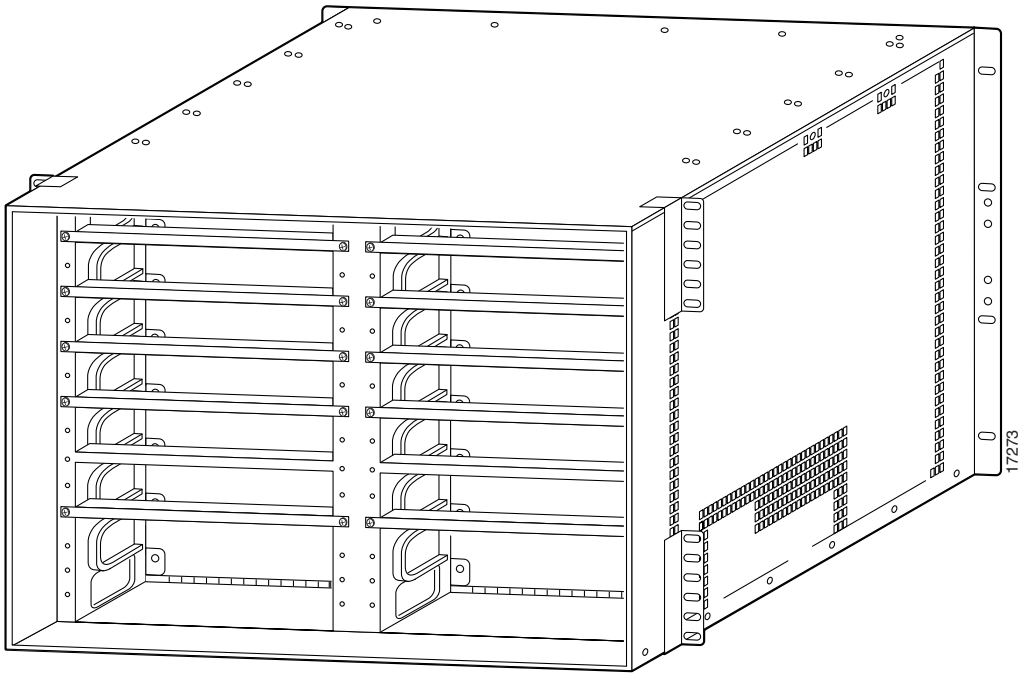
Step 2 Place two spacers (about 0.060 inch [1/16 inch] thick by about 2 inches by 30 inches, fabricated from HDPE, aluminium or cardboard). One spacer should be on the left edge and one on the right edge of the switch.

Step 3 Slide the switch across the spacers and position it in the rack.

Step 4 Use the 10-32 truss head screws to secure the switch to the front-mounting rails.

Step 5 Attach the rear-mounting brackets to the rack (see Figure 5-75).

Figure 5-75 Rear View with the Rear-Mounting Brackets Attached



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Step 6 Use the 10-32 truss head screws to secure the switch to the rear-mounting brackets.

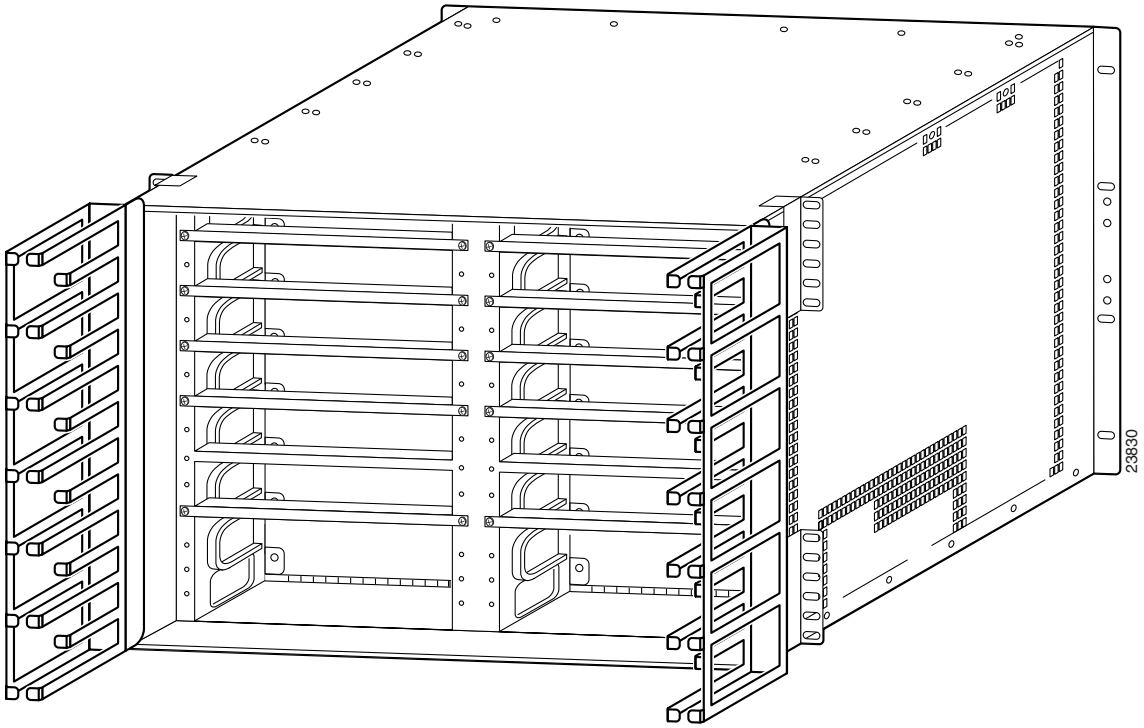
Install the Cable Management Assembly

The cable management assembly consists of two identical, vertical cable managers, two mounting brackets, and screws. Complete the following steps to install the cable management assembly after the switch is installed in the chassis:

Step 1 Use the provided No. 10-32 screws and the appropriate screwdriver to attach the two mounting brackets to the rear of the switch.

Step 2 Use the provided No. 10-32 screws and the appropriate screwdriver to install the cable managers on the mounting brackets (see Figure 5-76).

Figure 5-76 Cable Management Assembly on the Rear of the Switch



Connect the AC Power Supply Tray to the MGX 8830 Switch

Caution Do not use a power screwdriver on captive screws.

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If you are using AC power, complete the following steps to connect the AC power supply tray to the MGX 8830 switch. If you are using DC power, proceed to the "Connect the Back Cards" section on page 5-124.

Note One end of the AC power supply cable has a fixture that installs in the DC PEM slots of the switch. The other end of the cable attaches to the AC power supply.

Step 1 Position the fixture, located on the end of an AC power supply cable, over a DC PEM slot guides and align the fixture edge with the slot guides (left and right) in the chassis.

Step 2 Gently apply even pressure to the sides of the faceplate while pushing the fixture into the slot.

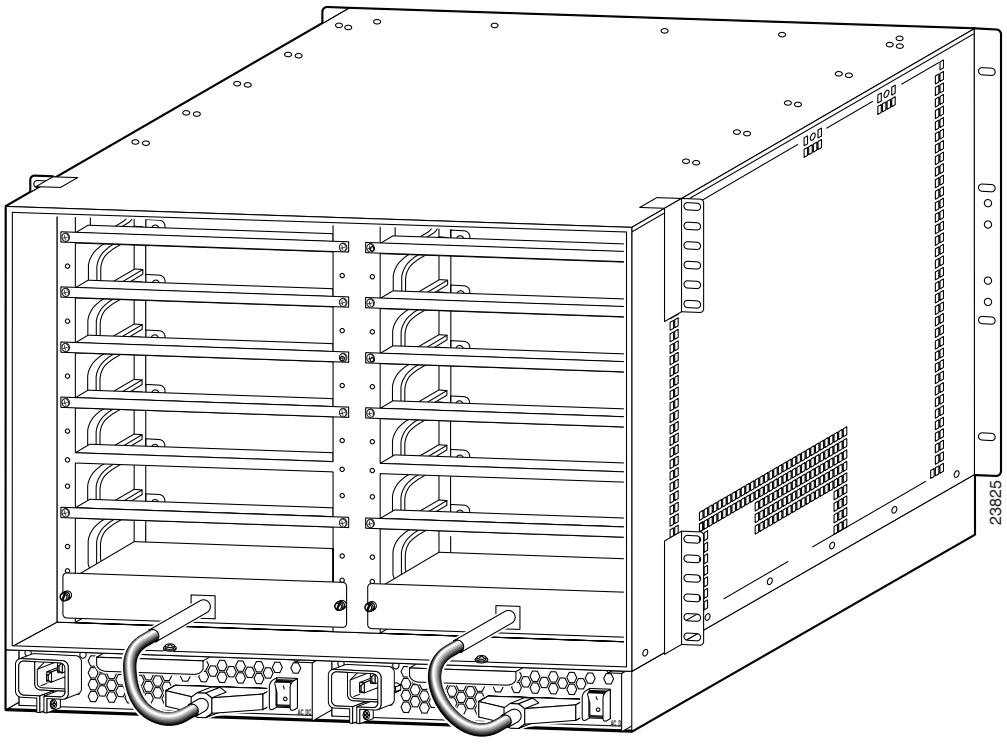
Step 3 Once the fixture is installed in the switch, apply even pressure to the sides of the faceplate to fully seat the fixture.

Step 4 Use the flat-head or Phillips tip of the 3-in-1 tool to tighten the two captive screws on the fixture faceplate. Do not overtighten the screws or use a power screwdriver.

Figure 5-77 shows the fixtures installed in the rear of the switch.

Note Without the AC power supply cable connected to the MGX 8830 midplane, through use of the fixture, the AC power supply will not power up. This is a safety feature.

Figure 5-77 Two AC Power Supplies Installed in the MGX 8830 Switch



Step 5 Connect the other end of the AC power supply cable to the AC power supply.

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Step 6 Repeat Step 1 through Step 5 with the other AC power supply cable to connect the second AC power supply.

Note When viewing the switch from the rear, the AC power supply cable from the left AC power supply is connected to the fixture on the left side of the midplane. Likewise, the AC power supply cable from the right AC power supply is connected to the fixture on the right side of the midplane. (See Figure 5-77.)

Caution Do not plug in the AC power cord at this time.

Connect the Back Cards

Connect the interfaces from the back cards to the appropriate end device. See Appendix B, "Cable Specifications" for cabling specifications and pinouts.

Once you have connected your back cards, route the cables through the cable management assembly. The left card set cables run to the left cable management panel, and the right card set cables run to the right cable management panel.

Connect the Console Port

The command line interface (CLI) management tool allows you to configure the switch and display the switch status. When a switch starts up for the first time, the only CLI access available is through the console port (CP).

Connect a VT-100 compatible terminal to the CP on the PXM-UI-S3 or PXM-UI-S3/B. Connect the terminal to a power source and set it up using the values that are shown in Table 5-8. Figure 5-78 shows the hardware required for a CP connection.

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Figure 5-78 Workstation Connection to the Console Port

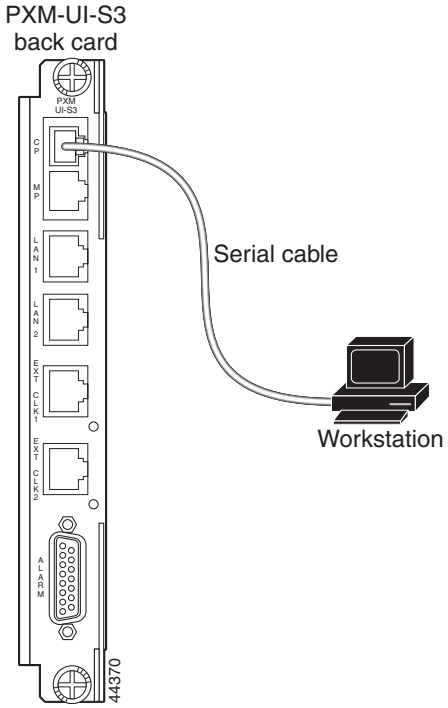

Table 5-8 Terminal Settings

Setting	Value
Baud rate	9600 bps
Character size	8 data bits
Parity	None
Stop bits	1
Hardware flow control	None

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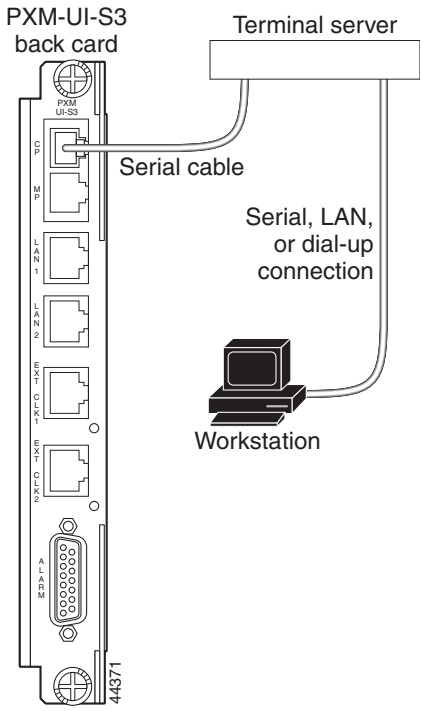
The CP connection can also be set up through a terminal server, as shown in Figure 5-79.

Figure 5-79 Terminal Server Connection to the Console Port



For further information about server management and configuration setup, refer to the appropriate software configuration guide for your switch and your release.

Connect Power to the MGX 8830 Switch

The section provides the following installation procedures for connecting power to the switch:

- "Connect AC Power to the Switch" section on page 5-127
- "Connect DC Power to the Switch" section on page 5-127

Warning **Never install an AC power module and a DC power module in the same chassis.** Statement 264

Warning **Do not touch the power supply when the power cord is connected. For systems with a power switch, line voltages are present within the power supply even when the power switch is off and if the power cord is connected. For systems without a power switch, line voltages are present within the power supply when the power cord is connected.** Statement 4

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Connect AC Power to the Switch

Complete the following steps to connect AC power to the switch.

Note The AC power receptacle on the AC power supply tray is an IEC-type with a clamp. The AC voltage range is 90 to 264 VAC. See Table 3-19 for information about the types of AC power cords.

Step 1 Loosen the cable clamp around the AC receptacle on the AC power supply tray to allow clearance for the cable connector.

Step 2 Firmly seat the cable plug in the AC receptacle on the back of the AC power supply tray.

Step 3 Tighten the clamp.

Caution Verify that the branch circuit power is off before you insert the power cable into the wall outlet.

Step 4 Plug the other end of the AC power cord into the wall outlet.

Step 5 Repeat Step 1 through Step 4 for a second AC power supply, if appropriate.

Note If only one AC power supply is used in your switch, install black faceplates to cover the slot for the second AC power supply and the opening where the DC PEM would otherwise be installed.

If you are using DC power and only one DC PEM, cover the second DC PEM slot with a blank faceplate.

Step 6 Turn on the power source and turn the power switch on.

Step 7 Verify that the fans are running by listening or feeling for air movement. The following LEDs should be lit:

- The AC and DC LEDs on each power supply should be green.
- The Status LED on the PXM1Es should be green.
- The Standby LED on each service module should be yellow.

Connect DC Power to the Switch

DC power is connected to one or two DC PEMs located on the MGX 8830 chassis rear panel. You must supply the wiring from the DC source(s) to the DC PEM(s). The wiring should be 10 AWG (4 square millimeters).

Warning **Be sure the power to the shelf is OFF at this point. DO NOT apply power until later.**

Complete the following steps to connect DC power to the MGX 8830:

Step 1 Locate the DC PEM(s) on the rear panel of the MGX 8830. (See Figure 5-80 for DC PEM location.)

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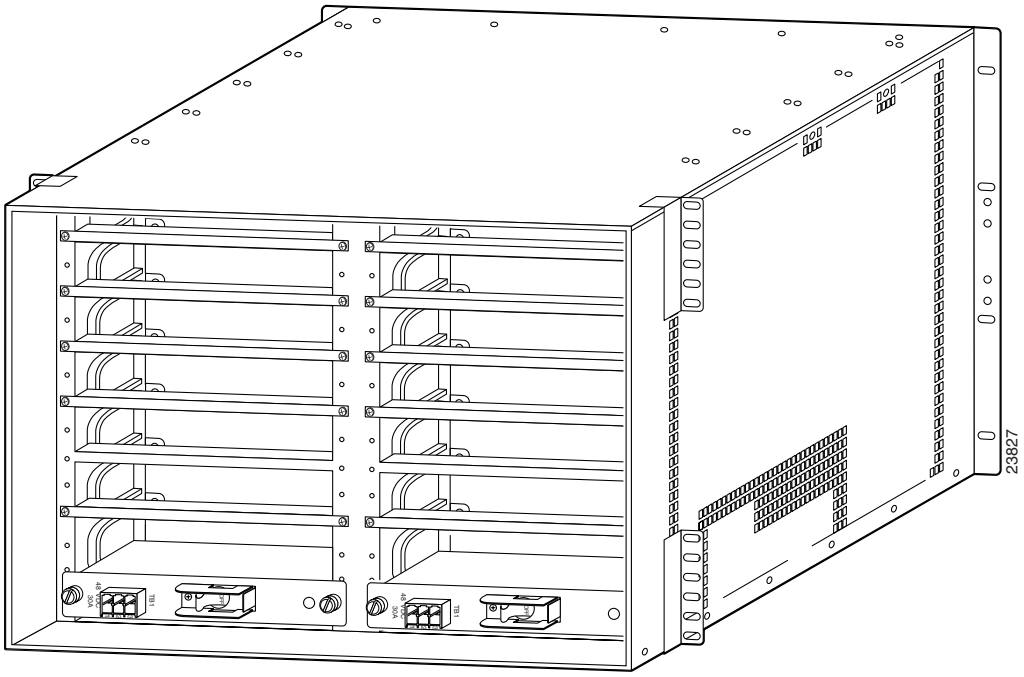
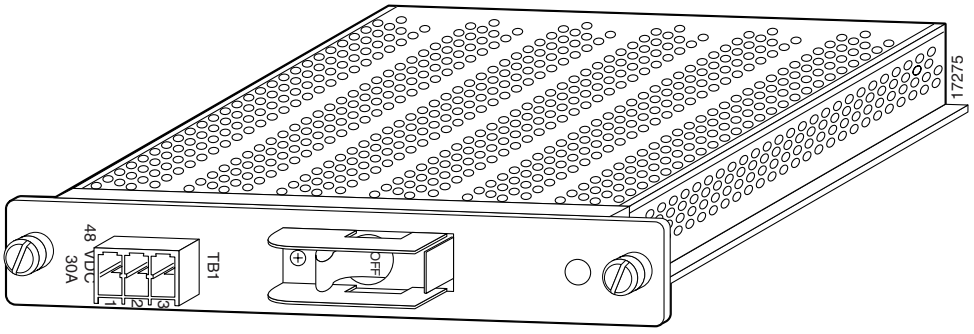
Figure 5-80 Rear View of the MGX 8830 with Two DC PEMs Installed



Note Depending on your order, there will be either one or two DC PEMs installed and shipped with your MGX 8830 system.

Step 2 Locate the pluggable terminal block (TB1) on the DC PEM to which you are connecting source power Figure 5-81 shows the DC PEM faceplate.

Figure 5-81 DC PEM Faceplate



Step 3 Note the polarities of the TB1 connection points.

Figure 5-82 illustrates the polarity of each connection on the pluggable terminal block. The numbers start with 1 on the left and go to 3. The connection at the left is for the –48 VDC wire. The middle wire is safety ground. The connection at the right is for the positive return wire (for the –48 VDC).

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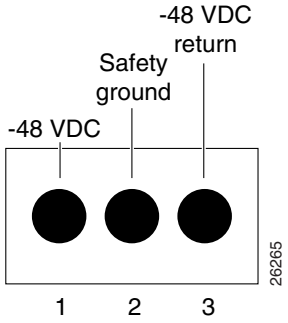
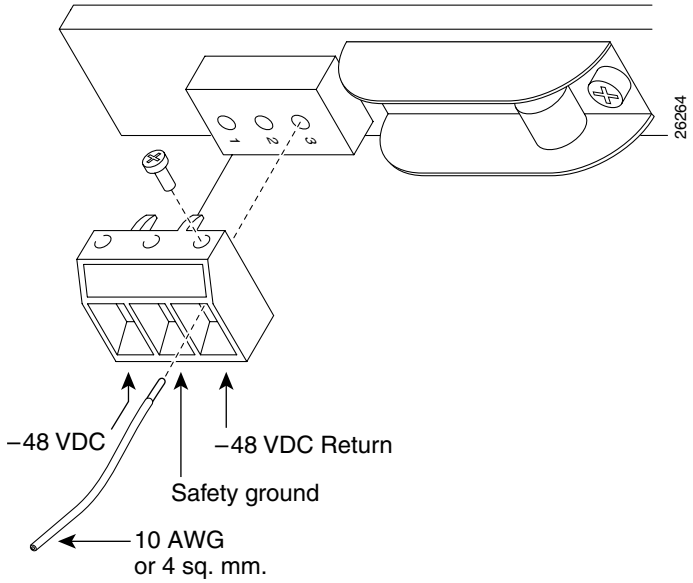
Figure 5-82 Polarities at the MGX 8830 PEM Pluggable Terminal Block



Step 4 Locate the wiring block for TB1.

Figure 5-83 illustrates the TB1 wiring block (that is, the mating plug that attaches to TB1).

Figure 5-83 Pluggable Terminal Block on MGX 8830 DC PEM



Step 5 Insert and secure the stripped ends of the 10 AWG wire in the wiring block as shown in Figure 5-82 and Figure 5-83. Figure 5-83 shows the assembly with an example wire and the screw that secures it in the pluggable wire block.

Step 6 Plug the pluggable terminal block to the receptacle TB1 on the DC PEM.

Step 7 For each DC PEM, connect the DC input wiring to a separate dedicated DC source capable of supplying at least 30 amps (typical).

The –48VDC power source in the building should have a 30 Amp DC circuit breaker. The building's wiring should include an easily accessible disconnect device. Make sure the safety ground wire connects to a reliable building (earth) ground.

Warning **For personnel safety, the green or green/yellow wire must connect to safety (earth) ground at both the equipment and at the supply side of the DC wiring.**

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Step 8 If you have a redundant DC PEM installed in your MGX 8830, repeat Step 1 through Step 7 for the second DC PEM.

Step 9 Before you turn on the system power, check the supply voltage.

The screws at positions 1 and 3 on the pluggable terminal block are convenient measuring points. Also, check the impedance between the safety ground (screw at location 2 on the pluggable terminal block) and the chassis. It should be close to 0.

Step 10 Verify that the DC PEM circuit breakers are in the OFF position.

Step 11 Turn on the source power, and check the voltage at the screws at positions 1 and 3 on the pluggable terminal block for all installed PEMs.

Step 12 Turn off the source power and proceed to the "Install the Cable Management Assembly" section on page 5-122.

Step 13 Turn on the power source and turn the power switch on.

Step 14 Verify that the fans are running by listening or feeling for air movement. The following LEDs should be lit:

- The AC and DC LEDs on each power supply should be green.
- The DC OK LED on each DC PEM should be green.
- The Status LED on the PXM1Es should be green.
- The Standby LED on each service module should be yellow.

Connect the External Clock

This step is optional. For information, see "Connect the External Clock" section on page B-7.

Connect the Alarms

Note This step is optional.

Dry contact relay closures are available for forwarding MGX 8830 switch alarms to an alarm system. Separate visual and audible alarm outputs are available for critical, major, and minor alarm outputs, and the outputs are provided through the use of a DB-15 connector on the PXM user interface back card (PXM-UI-S3 and PXM-UI-S3/B).

Complete the following steps to connect the external clock:

Step 1 Verify that you have a PXM-UI-S3 or PXM-UI-S3/B back card installed in slots 1 and 2 in the rear bay of the switch.

Step 2 Connect the DB-15 cable to the ALARM port on the PXM-UI-S3 or PXM-UI-S3/B back card.

Note See Appendix B, "Cable Specifications" for cable requirements.

Step 3 Connect the other end of the cable to the alarm source.

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Connect the MP Connection

Note This step is optional.

A dial-up connection extends switch management to all workstations that have access to the public switched telephone network (PSTN).

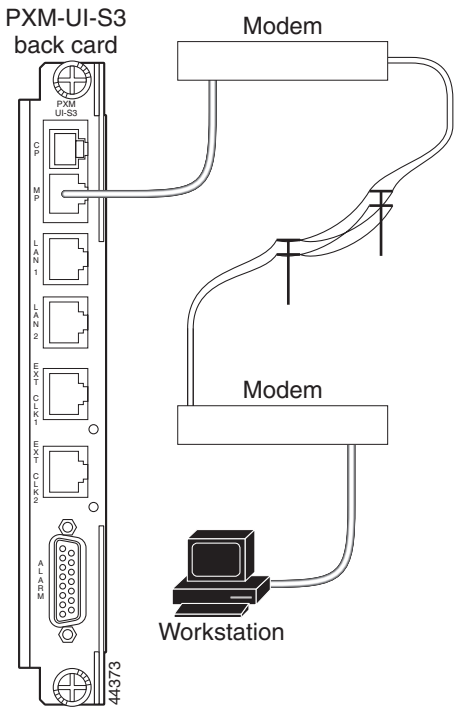
PXM-UI-S3

Connect the maintenance port (MP) on the PXM-UI-S3 card to a modem. Connect the terminal to a power source and set it up using the values that are shown in Table 5-8. This modem is connected through the PSTN and is accessible from a workstation, as shown in Figure 5-84.

PXM-UI-S3/B

A PXM-UI-S3/B card does not have a maintenance port. For the PXM-UI-S3/B card, a modem can be connected to the console port instead of the MP.

Figure 5-84 Modem Connection to the Maintenance Port



For further information about server management and configuration setup, refer to the appropriate software configuration guide for your switch and your release.

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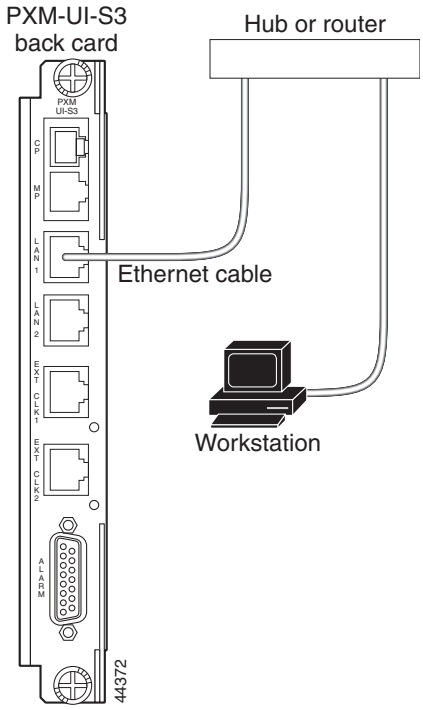
Connect the LAN1/2 Ports

Note This step is optional.

A local LAN connection extends switch management to all workstations that have connectivity to the LAN to which the switch is connected.

Connect the LAN 1 port on the PXM-UI-S3 or PXM-UI-S3/B to a hub or router. This hub or router is connected to a workstation, as shown in Figure 5-85.

Figure 5-85 Ethernet Connection to the LAN 1 Port



Note The LAN 2 port in Figure 5-85 is not enabled.

For further information about server management and configuration setup, refer to the appropriate software configuration guide for your switch and your release.

Verify EMI Compliance

Warning **Blank faceplates and cover panels serve three important functions: they prevent exposure to hazardous voltages and currents inside the chassis; they contain electromagnetic interference (EMI) that might disrupt other equipment; and they direct the flow of cooling air through the chassis. Do not operate the system unless all cards, faceplates, front covers, and rear covers are in place.** Statement 1029

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Step 1 If your switch has an (optional) front door, verify that the door is installed and closed *and* that each empty slot is covered by a blank faceplate.

Step 2 Install the ferrite bead if needed. Refer to "Installing the Ferrite Bead on the PXM-UI-S3/B Card" section on page 5-133.

Note Refer to the appropriate software configuration guide for your switch and your release to configure general switch features.

Installing the Ferrite Bead on the PXM-UI-S3/B Card

The PXM-UI-S3/B back card is used in the following MGX chassis:

- MGX 8850 (PXM45), with a Model PXM45/C card
- MGX 8850 (PXM1E)
- MGX 8850/B
- MGX 8830 (PXM1E)
- MGX 8830/B
- MGX 8950, with a Model PXM45/C card
- MGX 8880

The ferrite bead kit is part MGX-FBK. The kit includes seven ferrite beads and installation instructions packaged in bubble wrap. Each ferrite bead is part 36-0217-01. The installation instructions, which mirror this section, are part 78-16699-01. The ferrite bead kit ships with the PXM-UI-S3/B back card.

Caution To keep EMI to a minimum, and for the PXM-UI-S3/B back card to be CE and FCC Class A compliant, you must install a ferrite bead on each cable that attaches to the PXM-UI-S3/B back card with an RJ connector. *Use shielded cable*.

How to Install the Ferrite Bead

Cables that attach to the PXM-UI-S3/B back card with an RJ connector require a ferrite bead—that is, cables leading to RJ connectors 1, 3, 4, 5, and 6 in Figure 5-86.

The ferrite bead locking mechanism is a plastic, snap shut design located in three places along its length (see Figure 5-87). To install the ferrite bead:

Step 1 If the ferrite bead is open, skip to Step 2.

If the ferrite bead is closed, place the bead on a flat surface, insert a small flat-blade screwdriver into the recessed area under each of the three locking tabs (item 1 in Figure 5-86), and carefully pry outward to unlock the mechanism.

Step 2 Place the open ferrite bead on the cable 1 to 6 inches (2.54 cm to 15.24 cm) from the end to be connected to the RJ connectors located on the PXM-UI-S3/B back card (see Figure 5-87).

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Step 3 Snap the ferrite bead closed by pressing each half together until each of the three locking mechanisms snap firmly shut (see Figure 5-88).

Step 4 Repeat Step 1 through Step 3 for all cables that connect to the PXM-UI-S3/B back card with an RJ connector.

Figure 5-86 Place a Ferrite Bead on the Cables that Lead to RJ Connectors (1, 3, 4, 5, and 6)

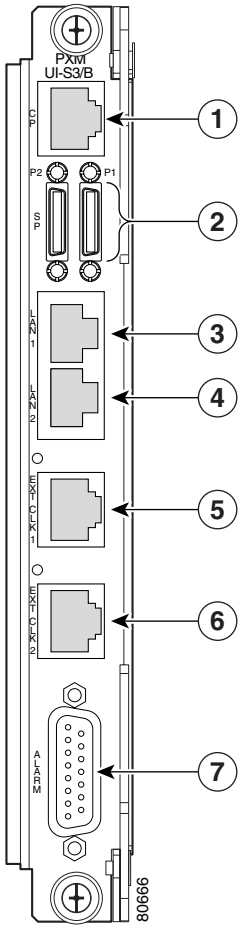

Figure 5-87 How to Open the Ferrite Bead

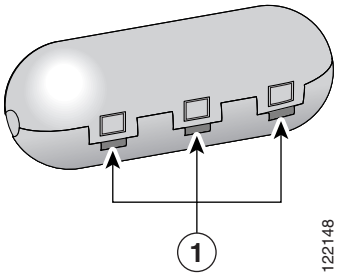

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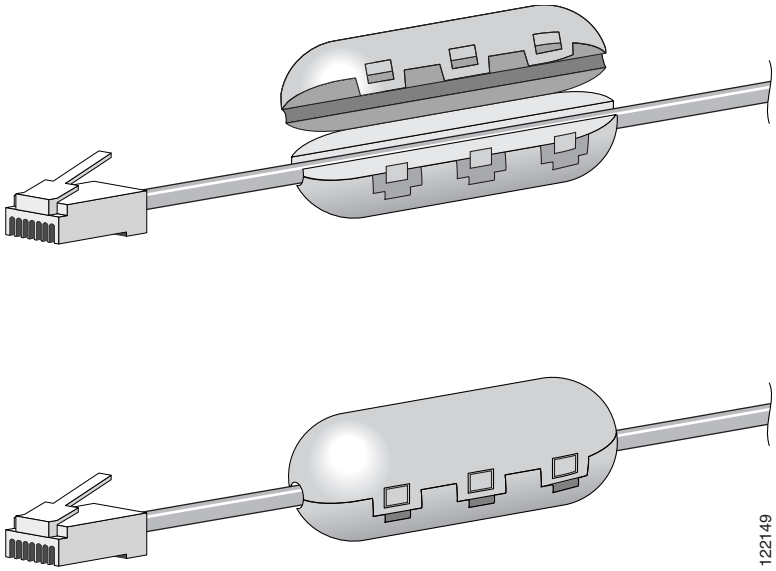
Figure 5-88 Snap the Ferrite Bead Closed on the Cable Leading to the PXM-UI-S3/B Back Card



Installing the Ferrite Bead on Ribbon Connectors

This section describes how to install ferrite beads on ribbon connectors that attach to RBBN-16-T1E1 back cards. The RBBN-16-T1E1 back card is used in the following MGX chassis:

- MGX 8850 (PXM45), with a Model PXM45/C card
- MGX 8850 (PXM1E)
- MGX 8850/B
- MGX 8830 (PXM1E)
- MGX 8830/B switch
- MGX 8950, with a Model PXM45/C card

A ferrite bead (part number 36-0170-01) and these instructions ship with the RBBN-16-T1E1 back card.

Caution To keep EMI to a minimum and for the RBBN-16-T1E1 back card to be CE and FCC Class A compliant, you must install two ferrite beads on each cable that attaches to the RBBN-16-T1E1 back card with a ribbon connector.

Install the Ferrite Bead

Cables that attach to the RBBN-16-T1E1 back card with a ribbon connector require two ferrite beads on each cable. Each of the cables leads to ribbon connectors 3 and 4 in Figure 5-86.

The ferrite bead locking mechanism is a plastic, snap-shut design with two fasteners along its length.

To install the ferrite bead:

Step 1 If the ferrite bead is open, skip to Step 2.

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If the ferrite bead is closed, place the bead on a flat surface.

a. Insert a small flat-blade screwdriver into the recessed area under each of the two locking tabs.

b. Carefully pry outward to unlock the mechanism.

Step 2 Place the first open ferrite bead on the cable 8 inches from the end of the ribbon connector that is to be attached to the RBBN-16-T1E1 back card (see Figure 5-86).

Snap the ferrite bead closed by pressing each half together until the two locking mechanisms snap firmly shut.

Step 3 Place the second open ferrite bead on the same cable 60 inches from the end of the ribbon connector that is to be attached to the RBBN-16-T1E1 back card.

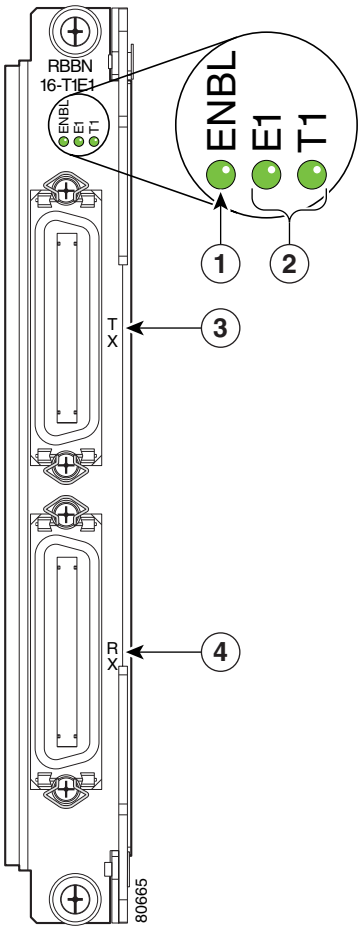
Snap the ferrite bead closed by pressing each half together until the two locking mechanisms snap firmly shut.

Step 4 To secure the beads, fasten one wire zip tie around the cable on each side of each bead.

Ensure that the ties are up against each side of the bead.

Step 5 (Optional) Repeat Step 1 through Step 4 for the other cable that connects to the RBBN-16-T1E1 back card.

Figure 5-89 Place Two Ferrite Beads on the Cables that Lead to Connectors 3 and 4



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First Time Power On Procedure for MGX Switches

This procedure describes how to bring up the following MGX chassis for the first time after they have been installed:

- MGX 8830 switch
- MGX 8830/B switch
- MGX 8850 (PXM1E) switch
- MGX 8850 (PXM45) switch
- MGX 8850/B switch
- MGX 8950 switch
- MGX 8880 media gateway

Note The same procedure applies to the MGX 8230 multiservice gateway, the MGX 8250 multiservice gateway, and the MGX 8850 (PXM1) multiservice switch, but further documentation for those products is outside the scope of this manual.

Prerequisites

The procedure assumes you have read and observed warnings in the following documents:

- *Installation Warning Card.* This two-page notice ships with spare cards. The notice is also accessible from http://www.cisco.com/univercd/cc/td/doc/product/wanbu/start/warncard.htm. The notice describes how to remove shipping tabs from the spare card, how to check that pins on the card are straight, and slots in which the card can be installed on the MGX chassis listed above.
- The hardware installation guide for your MGX product (see "Documentation" section on page 37).
- The *Regulatory Compliance and Safety Information for Cisco Multiservice Switch Products (MGX, BPX, and SES)* booklet. This booklet ships with MGX products and is accessible at: http://www.cisco.com/univercd/cc/td/doc/product/wanbu/mgx8830/hwdoc/rcsi.htm. The booklet contains translations of the warnings used in MGX, BPX, and SES hardware installation manuals.
- MGX switch and media gateway hardware installation guides as referred to in the "Documentation" section on page 37.

Tools Required

For this procedure, you will need the tools you have already used for installation, such as:

- A Phillips-head screwdriver
- A flat-tip screwdriver
- An ESD grounding wrist strap
- Technical documentation listed in "Documentation" section on page 37.

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General Power On Sequence and Checkout

The general procedure includes these steps:

1. Install the MGX chassis (if required).
2. Ensure no cards are in the chassis, or unseat them, so there is no electrical connection to the chassis.
3. Power on the chassis.
4. Install the primary PXM controller back cards, then front card. Check the cards' operation.
5. Install the redundant PXM controller back cards, then front card. Check the cards' operation.
6. Install service modules and their back cards, one at a time, and check their operation.

Specific Power On Sequence and Checkout

The specific procedure includes these steps:

Step 1 Set up the chassis with the appropriate number of power supplies, fan trays, air intake plenum, and fan cables installed.

- Use the power calculation tables in the hardware guide or ordering tool to ensure your chassis has the right number of power supplies.
- Your chassis might be shipped fully configured, or you might need to install the chassis and cards using the instructions in the manual. See "Documentation" section on page 37 for which manual to use.

Caution Do NOT install all the service modules before you power the switch on for the first time. Instead, it is recommended that you install one module at a time to limit the number of cards that could be damaged if there were a problem with the chassis electronics.

Step 2 If your chassis was shipped with cards installed, unseat or remove all cards so there is no electrical connection between the cards and the chassis.

Step 3 Turn the chassis on at the power supply. The power supply LEDs should light. Listen for the fans spinning up to speed.

Caution If fans do not come on, immediately power down the chassis to prevent overheating.

Caution Before handling any cards, wear a wrist strap connected to metal on the card chassis to prevent electrostatic damage to the cards.

Step 4 Refer to Table 5-9 to confirm which type of PXM controller card is compatible with which MGX chassis, and to confirm in which slot the PXM card(s) can be installed.

Caution **This is an important step, because inserting the wrong card in the wrong slot can damage the chassis or the card.**

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Step 5 Insert in the back cards and console port cable for the primary PXM controller card. For example, on an MGX 8850 (PXM45) chassis, the PXM-UI-S3 or PXM-UI-S3/B back card supports the PXM45 front (controller) card. For this example, the primary PXM full-height card will be in slot 7 and 23 when viewed from the front of the chassis. Then insert the half-height PXM-UI-S3 or PXM-UI-S3/B back card in back of the chassis, in the top bay behind slot 7. The PXM-HD (hard disk) card would be inserted in the back of the chassis, in the lower bay behind slot 23.

Table 5-9 Slot Compatibility for MGX Chassis and Their PXM and SRM Cards

MGX Switch or Gateway	Processor Switch Module (PXM) Type and Slots	Service Resource Module (SRM) Slots
MGX 8230 multiservice gateway	*PXM1, Slots 1 and 2*	Slots 7 and 14
MGX 8250 multiservice gateway	*PXM1, Slots 7, 8, 23, and 24*	Slots 15, 16, 31, and 32
MGX 8830 multiservice switch	*PXM1E, Slots 1 and 2*	Slots 7 and 14
MGX 8850 (PXM1) multiservice switch	*PXM1, Slots 7, 8, 23, and 24*	Slots 15, 16, 31, and 32
MGX 8850 (PXM1E) multiservice switch	*PXM1E, Slots 7, 8, 23, and 24*	Slots 15, 16, 31, and 32
MGX 8850 (PXM45) multiservice switch	*PXM45, Slots 7, 8, 23, and 24*	Slots 15, 16, 31, and 32
MGX 8880 media gateway	*PXM45, Slots 7, 8, 23, and 24*	Slots 15, 16, 31, and 32
MGX 8950 core multiservice switch	*PXM45, Slots 7, 8, 23, and 24*	Slots 9, 10, 25, and 26 are reserved for XM60 cards

Step 6 Insert the primary PXM front card.

Step 7 Through the console port connection, monitor the primary PXM card as it comes up to Active status. When the card is Active, the prompt will appear like *n*.7.PXM.a>.

- Use display environment statistics or alarm commands (**dspenvalms** or **dspenvstats**) to ensure that all components such as power supplies and fans are running. See the following example:

```
M8850_LA.7.PXM.a > dspenvalms

M8850_LA                          System Rev: 05.00   Apr. 26, 2004 19:52:30 GMT
MGX8850                                               Node Alarm: MAJOR
ENVIRONMENTAL ALARM STATE INFO   ^Notification Disabled
   Alarm Type      Unit   Threshold      DataType   Value       State
 ----------------  ---- --------------   -------- ---------- -------------
 Temperature             <= 50            Celsius   34       Normal

 Power Supply       A1   none             None      none     Normal
 Power Supply       A2   none             None      none     Normal
 Power Supply       A3   none             None      none     Missing
 DC Voltage         A    42  to 58        VoltsDC   49       Normal

 Power Supply       B1   none             None      none     Missing
 Power Supply       B2   none             None      none     Missing
 Power Supply       B3   none             None      none     Missing
 DC Voltage         B    42  to 58        VoltsDC   0        Normal

 Top Fan Tray       1    >= 2000          RPM       3594     Normal
 Top Fan Tray       2    >= 2000          RPM       3534     Normal
 Top Fan Tray       3    >= 2000          RPM       3594     Normal
 Top Fan Tray       4    >= 2000          RPM       3498     Normal
 Top Fan Tray       5    >= 2000          RPM       3414     Normal
 Top Fan Tray       6    >= 2000          RPM       3558     Normal
```


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```
Top Fan Tray       7    >= 2000          RPM       3504     Normal
Top Fan Tray       8    >= 2000          RPM       3450     Normal
Top Fan Tray       9    >= 2000          RPM       3468     Normal

Bottom Fan Tray    1    >= 2000          RPM       0        Missing
Bottom Fan Tray    2    >= 2000          RPM       0        Missing
Bottom Fan Tray    3    >= 2000          RPM       0        Missing
Bottom Fan Tray    4    >= 2000          RPM       0        Missing
Bottom Fan Tray    5    >= 2000          RPM       0        Missing
Bottom Fan Tray    6    >= 2000          RPM       0        Missing
Bottom Fan Tray    7    >= 2000          RPM       0        Missing
Bottom Fan Tray    8    >= 2000          RPM       0        Missing
Bottom Fan Tray    9    >= 2000          RPM       0        Missing

+5V Input             4.850^ to 5.150^   VoltsDC   4.939    Informational
+3.3V Input           3.200^ to 3.400^   VoltsDC   3.259    Informational
+2.5V Input           2.425^ to 2.575^   VoltsDC   2.469    Informational
Calibration VDC        0x7e^ to 0x82^    Other     0x80     Informational
```

If the card comes up in backup boot, you need to copy firmware to the switch using FTP or TFTP. Instructions for "Copying Software Files to the Switch" are in Appendix A of the *Cisco MGX 8800/8900 Series Configuration Guide, Release 5.2 at* http://www.cisco.com/univercd/cc/td/doc/product/wanbu/8850px45/rel5/scg/mgx5scg.pdf. The Configuration Guide also describes how to connect to the console port and initialize the switch.

Step 8 Insert the standby PXM back cards, then the front card. Attach the console port cable to the back card.

Step 9 Through the console port connection, monitor the standby PXM card as it comes up to Standby mode. When the card is in Standby mode, the prompt will appear like *n*.8.PXM.s>.

- If the standby PXM card comes up in backup boot, you might need to load software onto the PXM card before proceeding.
- Check for alarms on the Standby PXM card from the Active PXM card. Use the display cards (**dspcds**) command to ensure that the Active PXM card has no alarms (Alarms = none). Also check that the Standby PXM card has no alarms.

Step 10 Put in the back cards (if any) for the Service Resource Modules (SRMs) for the primary PXM card. Then insert the SRM front card, one at a time. See if the SRM comes up. The green light comes on when it's active and functional. Check that there are no alarms as each card goes through the hardware check, loads firmware, and so on.

Step 11 Repeat Step 10 for the SRMs for the secondary PXM.

Note Refer to Table 5-9 for the proper slots in which to insert SRM cards.

Step 12 Install the remaining front and back cards, one card set at a time. Check operation at the console port for each card, using display commands. As you install each card set, verify that it has come up properly.

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CHAPTER 6

Maintaining the Cisco MGX Switch or Gateway

This chapter contains maintenance procedures for the Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8850/B, Cisco MGX 8950, Cisco MGX 8830, Cisco MGX 8830/B switches and the MGX 8880 Media Gateway. Procedures are the same for all these products unless otherwise noted.

Note The information in this guide does not apply to the Cisco MGX 8850 (PXM1) switch.

This chapter contains the following sections:

- Swapping a Primary or Redundant DC Power Entry Module with Power On, page 6-2
- Removing and Installing the Double-Height Front Cards, page 6-4
- Removing and Installing the Single-Height Front Cards, page 6-8
- Removing and Installing the Back Cards, page 6-9
- Removing and Installing Back Card Transceivers, page 6-12
- Replacing the Air Intake Plenum Filter, page 6-13
- Removing the Center Guide Modules, page 6-14
- Connecting the Back Cards to the APS Connector, page 6-17
- Installing the APS Assembly in the Switch, page 6-19
- Removing the Back Cards from an APS Assembly, page 6-21
- Installing or Removing Redundancy Connectors, page 6-22
- Installing and Removing the AXSM-XG Extender Connector, page 6-27

Warning **Only trained and qualified personnel should be allowed to install or replace this equipment.** Statement 49

Warning **This unit is intended for installation in restricted access areas. A restricted access area is where access can only be gained by service personnel through the use of a special tool, lock and key, or other means of security, and is controlled by the authority responsible for the location.** Statement 37

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Swapping a Primary or Redundant DC Power Entry Module with Power On

If necessary, you can replace either a primary or a redundant DC power entry module (PEM) with power on. To avoid possibly tripping the system circuit breaker in the process, complete the following steps.

Caution Do not use a power screwdriver on captive screws.

Warning **Before working on a chassis or working near power supplies, unplug the power cord on AC units; disconnect the power at the circuit breaker on DC units.** Statement 12

Step 1 Connect a grounding strap to the ESD grounding jack or to the equipment rack.

Step 2 Turn off the circuit breaker only on the DC PEM that you intend to replace.

Step 3 Turn off the branch circuit at the DC source (the distribution box, for example) for the correct branch.

Step 4 Disconnect DC source wiring:

- If your terminal block has a plastic cover, complete Step 5 and Step 6 to disconnect the DC source wiring. Then proceed to Step 10.
- If your terminal block does not have a plastic cover, proceed to Step 7.

Step 5 Use a Phillips-head screwdriver to remove the plastic terminal block cover on the DC PEM that you intend to replace (see Figure 6-1).

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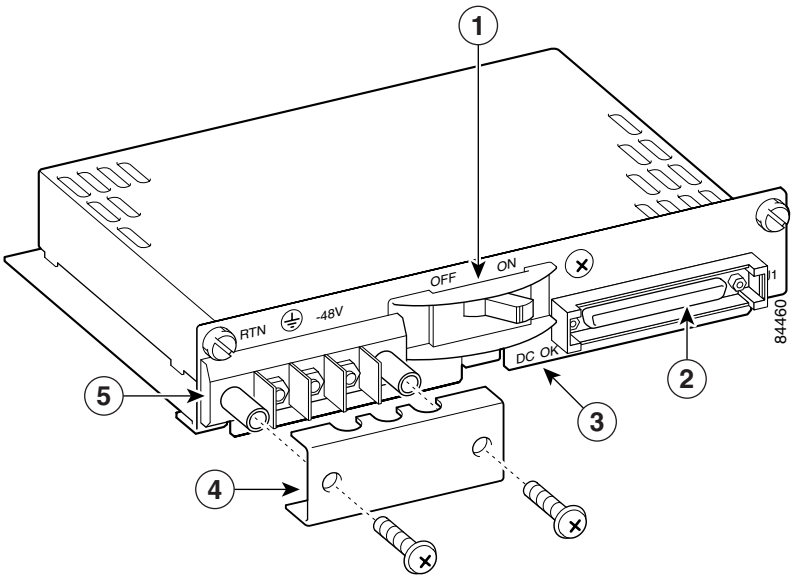
Figure 6-1 DC PEM Faceplate



1	Two-position circuit breaker. The positions are Off and On.	**4**	Plastic cover.
2	J1 output connector.	**5**	Terminal block 1 (DC input).
3	LED showing status of the DC PEM.		

Step 6 Disconnect DC source wires at the wiring terminal blocks on the DC PEM. Proceed to Step 10.

Step 7 If your terminal block does not have a plastic cover, locate the backplane end of the system power cable for the DC PEM that you intend to replace.

Caution The cable connector must be disconnected at the backplane first, when you are inserting or removing the PEM with power on. If you disconnect the cable at the PEM first when power is on, the cable contacts are energized. If the energized cable contacts touch the surface of the chassis or any metal connected to the chassis, the –48 VDC is shorted to the chassis, and the circuit breaker on the still-active PEM opens, shutting down the system.

Step 8 At the backplane end of the system power cable, loosen the captive screws on the cable bracket.

Step 9 Pull the cable bracket out approximately 1 inch to disconnect the cable.

Step 10 At the end of the system power cable connected to the DC PEM, loosen the jack screws and disconnect the cable from the DC PEM.

Step 11 Remove the DC PEM.

Step 12 Make sure that both the DC PEM and the branch circuit breakers are in the off position.

Step 13 Insert the replacement DC PEM and tighten the captive mounting screws.

Step 14 Connect the system power cable at the DC PEM.

Step 15 Connect the backplane end of the system power cable to the backplane. This requires some dexterity, especially if the cabling around the system power cable is dense. Grasp the cable bracket at the captive screws and gently push the bracket straight in. Furthermore:

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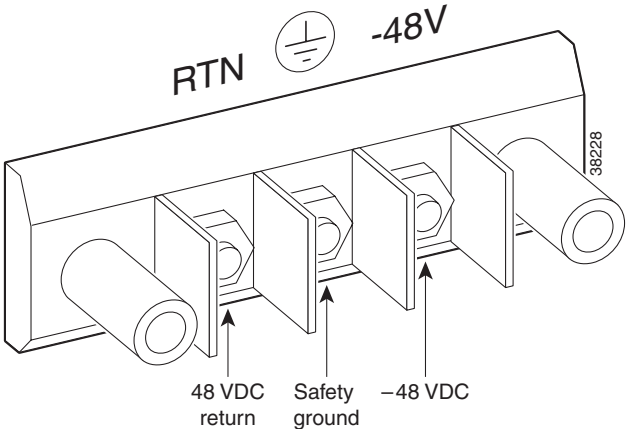
- To align the pins of the backplane and cable pins, move the cable connector slightly up and down or side to side until the connectors are aligned and able to mate. When executing this step, keep the bracket as level as possible.
- The connector is fully inserted when the connector shell (housing) is all the way into the enclosure hole and the exterior of the shell with the captive screws is flush with the enclosure.

Step 16 Tighten the connector screws.

Step 17 Attach the DC source wires at the wiring block on the DC PEM (see Figure 6-2).

Figure 6-2 Terminal Block on the DC PEM



Step 18 If the plastic cover was removed in Step 5, reattach it over the terminal block (see Figure 6-1).

Step 19 Turn on the DC power at the circuit branch source.

Step 20 Turn on the circuit breaker of the DC PEM.

Removing and Installing the Double-Height Front Cards

The following sections describe how to remove and install a double-height front card. Cards are installed vertically on the MGX 8850 (PXM1/PXM45), MGX 8850/B, MGX 8950, and MGX 8880 chassis; cards are installed horizontally on the MGX 8830 and MGX 8830/B chassis.

Note All cards must be fully seated in the chassis. When installing the front card, apply even pressure to the top and bottom of the faceplate to make sure that the card is fully seated.

The card should slide in and out with only slight friction on the adjacent board's EMI gaskets. Do not force the card. Investigate any binding.

Caution Proper ESD protection is required whenever you handle Cisco equipment. Installation and maintenance personnel should be properly grounded through the use of grounding straps to eliminate the risk of ESD damage to the equipment. Modules are subject to ESD damage whenever they are removed from the chassis.

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Caution When extracting a front card, keep the card level until it is completely extracted from the chassis. Do not allow the front cards to drop against the cards below them. This could damage components on the cards.

Caution To prevent damage to components on the bottom side of a card, support the faceplate and keep the card level while sliding it into the chassis.

Warning **Blank faceplates and cover panels serve three important functions: they prevent exposure to hazardous voltages and currents inside the chassis; they contain electromagnetic interference (EMI) that might disrupt other equipment; and they direct the flow of cooling air through the chassis. Do not operate the system unless all cards, faceplates, front covers, and rear covers are in place.** Statement 142

Remove the Double-Height Front Cards

A card is seated firmly in a chassis by inserting the card and closing the levers at the top and bottom. Use the following steps to remove double-height front cards from the chassis.

How Most Card Levers Work

Step 1 Open the front door of the chassis, if a door is present.

Step 2 Connect a grounding strap to the ESD grounding jack or to the equipment rack.

Step 3 Press the flat-head tip of the 3-in-1 tool into the slot of the extractor lever *until the lever springs open* (see Figure 6-3).

- In an MGX 8830 switch, cards are installed horizontally, so the slots are at the left and right sides of the card, as opposed to top and bottom.
- Each double-height front card has an extractor lever at the top and bottom.

Step 4 Pull the extractor levers to disconnect the front card from the midplane.

Step 5 Gently pull the front card out of the card cage, keeping the card level so that it does not contact the card below it.

How VXSM Card Levers Work

The VXSM front cards use a dual lever system. To install a VXSM card:

Step 1 Hold up the metal lever at the top of the card.

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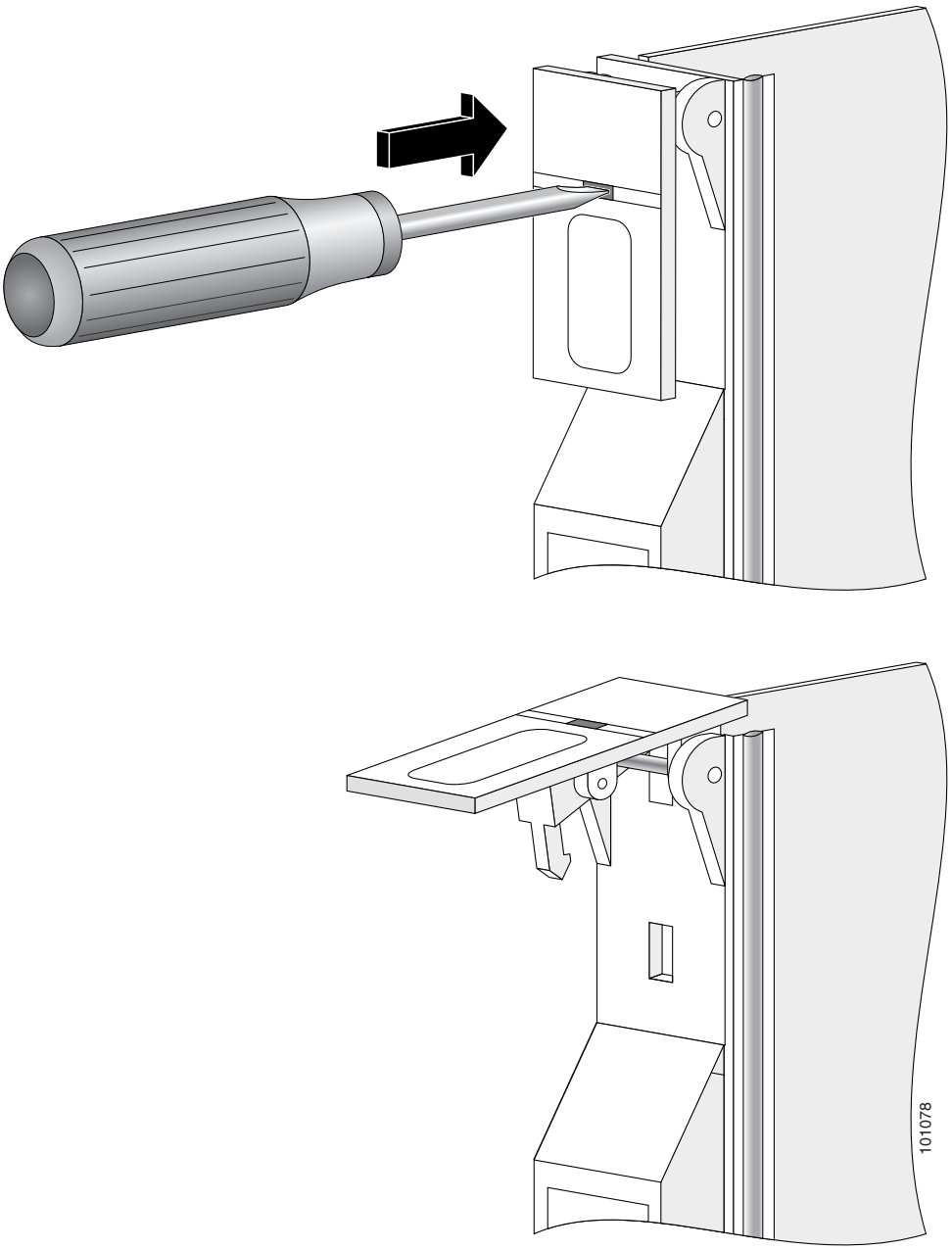
Step 2 Push down on the plastic lever.

Figure 6-3 How to Open a Card's Latch or Extractor Lever



Step 3 Either replace the front card that you remove or insert a blank faceplate in the empty slot.

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Install the Double-Height Front Cards

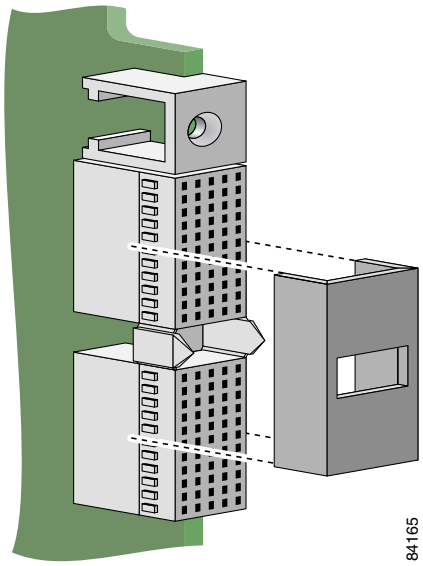
Complete the following steps to install double-height front cards in the chassis:

Step 1 Connect a grounding strap to the ESD grounding jack or to the equipment rack.

Step 2 Verify that there are no bent pins, bent dividers, or damaged connectors on the front cards (see the "Card Installation and Replacement Suggestions" section on page 3-8).

Step 3 Remove the plastic protective cover from the rear edge of the card, as shown in Figure 6-4. This cover protects the alignment tabs during shipping.

Figure 6-4 Protective Cover Removal



Step 4 Verify that the extractor levers are in the unlatched position.

Step 5 Position the front card over the appropriate slot and align the front card edge with the slot guides (top and bottom) in the chassis.

Step 6 Lift up and out on the extractor levers and gently apply pressure to the faceplate while pushing the front card into the slot.

Step 7 After the front card is installed in the chassis, apply even pressure to the top and bottom of the faceplate to fully seat the front card.

Step 8 Press down on the extractor levers until they latch to secure the front card.

Note If you are installing the front card for the first time, refer to the configuration procedures in the appropriate software configuration guide.

Step 9 Close the front door, if present.

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Removing and Installing the Single-Height Front Cards

The following sections describe how to remove and install a single-height front card.

Note All cards must be fully seated in the chassis. When installing the front card, apply even pressure to the top and bottom of the faceplate to make sure that the card is fully seated.

The card should slide in and out with only slight friction on the adjacent board's EMI gaskets. Do not force the card. Investigate any binding.

Caution If the AXSM-1-2488 or AXSM-1-2488/B front cards are installed with incorrect back cards, you may damage the cards.

Caution Proper ESD protection is required whenever you handle Cisco equipment. Installation and maintenance personnel should be properly grounded through the use of grounding straps to eliminate the risk of ESD damage to the equipment. Modules are subject to ESD damage whenever they are removed from the chassis.

Caution When extracting a front card, keep the card level until it is completely extracted from the chassis. Do not allow the front cards to drop against the cards below them. This could damage components on the cards.

Caution To prevent damage to components on the bottom side of a card, support the faceplate and keep the card level while sliding it into the chassis.

Warning **Blank faceplates and cover panels serve three important functions: they prevent exposure to hazardous voltages and currents inside the chassis; they contain electromagnetic interference (EMI) that might disrupt other equipment; and they direct the flow of cooling air through the chassis. Do not operate the system unless all cards, faceplates, front covers, and rear covers are in place.** Statement 142

Remove the Single-Height Front Cards

Complete the following steps to remove single-height front cards from the chassis:

Step 1 Open the front door, if present.

Step 2 Connect a grounding strap to the ESD grounding jack or to the equipment rack.

Step 3 Insert and press the flat-head tip of the 3-in-1 tool into the slot of the extractor lever at the top of the front card until the lever springs open. Figure 6-3 shows the location of the lever slot in relation to the top of the front card.

Step 4 Pull the extractor lever to disconnect the front card from the midplane.

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Step 5 Gently pull the front card out of the card cage. Keep the front card level and make sure that it does not hit the one beneath it.

Step 6 Either replace the front card that you remove or insert a blank faceplate in the empty slot.

Install the Single-Height Front Cards

Complete the following steps to install single-height front cards in the chassis:

Step 1 Connect a grounding strap to the ESD grounding jack or to the equipment rack.

Step 2 Verify that there are no bent pins, bent dividers, or damaged connectors on the front cards (see the "Card Installation and Replacement Suggestions" section on page 3-8).

Step 3 Remove the plastic protective cover from the rear edge of the card, as shown in Figure 6-4. This cover protects the alignment tabs during shipping.

Step 4 Verify that the extractor lever is in the unlatched position.

Step 5 Position the front card over the appropriate slot and align the front card edge with the slot guides (top and bottom or left and right) in the chassis.

Step 6 Lift up and out on the extractor lever and gently apply pressure to the faceplate while pushing the front card into the slot.

Step 7 After the front card is installed in the chassis, apply even pressure to the top and bottom of the faceplate to fully seat the front card.

Step 8 Press down on the extractor lever until it latches to secure the front card.

Note If you are installing the front card for the first time, refer to the configuration procedures in the appropriate software configuration guide.

Removing and Installing the Back Cards

The following sections describe how to remove and install a back card.

Tip It is recommended that you label each cable and wire at both ends to identify its source and destination.

Note All cards must be fully seated in the chassis. When installing the back card, apply even pressure to the top and bottom of the faceplate to make sure that the card is fully seated.

The card should slide in and out with only slight friction on the adjacent board's EMI gaskets. Do not force the card. Investigate any binding.

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Caution Proper ESD protection is required whenever you handle Cisco equipment. Installation and maintenance personnel should be properly grounded through the use of grounding straps to eliminate the risk of ESD damage to the equipment. Modules are subject to ESD damage whenever they are removed from the chassis.

Caution If the AXSM-1-2488 or AXSM-1-2488/B front cards are installed with incorrect back cards, you may damage the cards.

Caution To prevent damage to components on the bottom side of a card, support the faceplate and keep the card level while sliding it into the chassis.

Caution Cards must be inserted in the correct slot positions. If service module back cards are installed in the wrong slots, electrical damage can occur. If a service module back card is inserted into a PXM back card slot, damage to the card and backplane can result.

Caution If you accidentally attempt to insert a service module back card into a PXM back card slot and then have difficulty operating the chassis, examine the backplane pins and back card connector to see if they have been bent or damaged.

Warning **Blank faceplates and cover panels serve three important functions: they prevent exposure to hazardous voltages and currents inside the chassis; they contain electromagnetic interference (EMI) that might disrupt other equipment; and they direct the flow of cooling air through the chassis. Do not operate the system unless all cards, faceplates, front covers, and rear covers are in place.** Statement 142

Remove the Back Cards

Complete the following steps to remove back cards from the chassis:

Step 1 Connect a grounding strap to the ESD grounding jack.

Step 2 Mark and disconnect all cables and wires from the back card.

Step 3 Use the flat-head or Phillips tip of the 3-in-1 tool to loosen the two captive screws located on the top and bottom of the back card faceplate.

Step 4 Pull each of the two extractor levers, located at the top and bottom of the faceplate, out to the horizontal position. These levers are at the left and right side of the faceplate in an MGX 8830 switch.

Note The SMFXX-4-2488-SFP and SMFXX-1-9953 double-height back cards have a single threaded screw instead of extractor levers.

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Step 5 Pull evenly on the two extractor levers to remove the back card from the card cage.

Step 6 Either replace the back card that you removed or cover the empty slot with a blank faceplate.

Note If a center guide module is removed from the rear and one double-height back card is installed, install a double-height blank faceplate in the gap adjacent to the installed double-height card. Two single-height blank faceplates cannot be used, because they require being screwed into the center guide module that was just removed.

Install the Back Cards

Complete the following steps to install back cards in the chassis:

Step 1 Connect a grounding strap to the ESD grounding jack.

Step 2 Verify that there are no bent pins, bent dividers, or damaged connectors on the back cards (see the "Card Installation and Replacement Suggestions" section on page 3-8).

Step 3 Remove the plastic protective cover from the rear edge of the card, as shown in Figure 6-4. This cover protects the alignment tabs during shipping.

Step 4 Verify that the two extractor levers on the back card are closed (flush with the vertical edge of the back card).

Step 5 Position the back card over the appropriate slot guides and align the back card edge with the slot guides (top and bottom or left and right) in the chassis.

Step 6 Gently apply even pressure to the top and bottom of the faceplate while pushing the back card into the slot.

Step 7 After the back card is installed in the chassis, apply even pressure to the top and bottom of the faceplate to fully seat the back card.

Step 8 Use the flat-head or Phillips tip of the 3-in-1 tool to tighten the two captive screws on the back card faceplate.

Note Tighten the top and bottom captive screws in increments to prevent misalignment of the card. Do not overtighten the screws, but tighten them enough to secure the card.

Step 9 If you disconnected the cables or wires from the back cards, reconnect them.

Note If you are installing the back cards for the first time, see Appendix B, "Cable Specifications" for cabling information.

If you are installing the back card for the first time, refer to the configuration procedures in the appropriate software configuration guide.

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Removing and Installing Back Card Transceivers

The following sections describe how to remove and install a back card transceiver.

Tip It is recommended that you label each cable and wire at both ends to identify its source and destination.

Caution Proper ESD protection is required whenever you handle Cisco equipment. Wear a grounding strap to eliminate the risk of ESD damage to the equipment. Modules are subject to ESD damage whenever they are removed from the chassis.

Remove the Back Card Transceivers

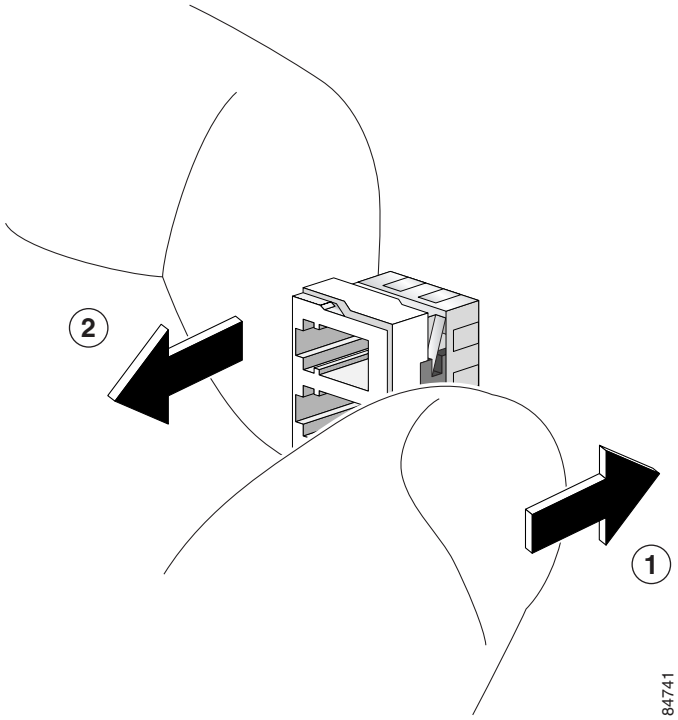
Complete the following steps to remove transceivers from the back cards:

Step 1 Connect a grounding strap to the ESD grounding jack.

Step 2 Mark and disconnect all cables and wires from the back card.

Step 3 Push the pink extraction ring around the transceiver toward the back card, as shown in Figure 6-5 (callout 1).

Figure 6-5 Transceiver Removal from the Back Card



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Step 4 While pressing the pink extraction ring against the back card, gently pull the transceiver away from the back card, as shown in Figure 6-5 (callout 2).

Install the Back Card Transceivers

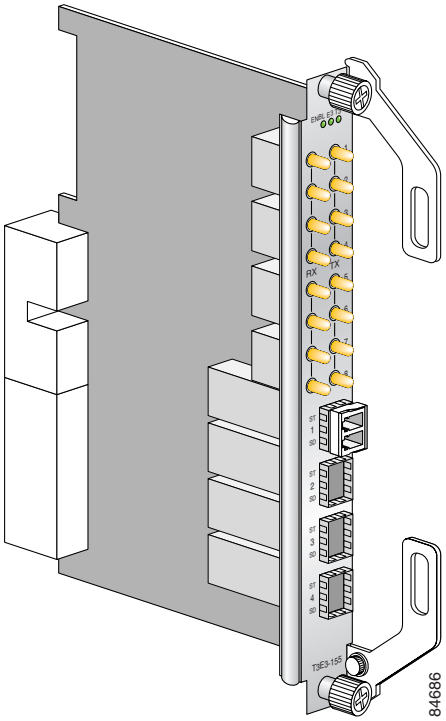
Complete the following steps to install transceivers in the back cards:

Step 1 Connect a grounding strap to the ESD grounding jack.

Step 2 Hold the transceiver so that the lever is on the left side.

Step 3 Gently push the transceiver in the appropriate empty port on the back card. Figure 6-6 shows the transceiver installed in the back card.

Figure 6-6 Transceiver Installed in the Back Card



Replacing the Air Intake Plenum Filter

There are two versions of the air intake plenum in the field:

- MGX-PLENUM= Support from Release 2 to Release 3.0.10
- MGX-PLENUM-FLTR=—Support from Release 4 and higher has the capability to hold an air filter. Air filters can be purchased through a third party

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The MGX 8850 (PXM1E/PXM45), MGX 8850/B and MGX 8950 switch each use a standard plenum. Starting May 2003, with MGX Release 4, the standard plenum has the ability to support an air filter. The purpose of the filter is to keep dust out of the interior of the switch.

Scheduled Maintenance of the Air Filter

This section describes the part numbers and procedures required for air filter maintenance.

Replacing the Filter

Note It is recommended that you visually inspect the air filter weekly. Replace the filter as required. The dustier the environment, the more frequently the filter should be replaced.

Note Cisco does not provide filter replacements for the MGX 88xx switches. Replacement air filters may be obtained from a third party.

Warning **Filters cannot be cleaned. They must be replaced.**

To replace the air filter:

Step 1 Ensure that the door on the MGX switch is fastened closed. The door must be closed to ensure proper alignment after service.

Step 2 Loosen the captive screws to the right and left of the air intake plenum.

Step 3 Open the plenum, which is hinged at the bottom.

- If the air filter inside is soiled, remove and discard the filter. Proceed to Step 4.
- If the air filter is clean, proceed to Step 5.

Step 4 Insert a new filter into the plenum.

Step 5 Close the air intake plenum. Tighten the captive screws.

Step 6 Record the date each time you replace the filter.

Removing the Center Guide Modules

To install double-height cards where single-height cards were installed, remove the center guide modules located at the front of the card cage (see Figure 6-7). Each center guide module encompasses two front card slots, so plan front card replacements accordingly. Install a blank faceplate over each empty slot in the new configuration to facilitate air flow and EMI containment.

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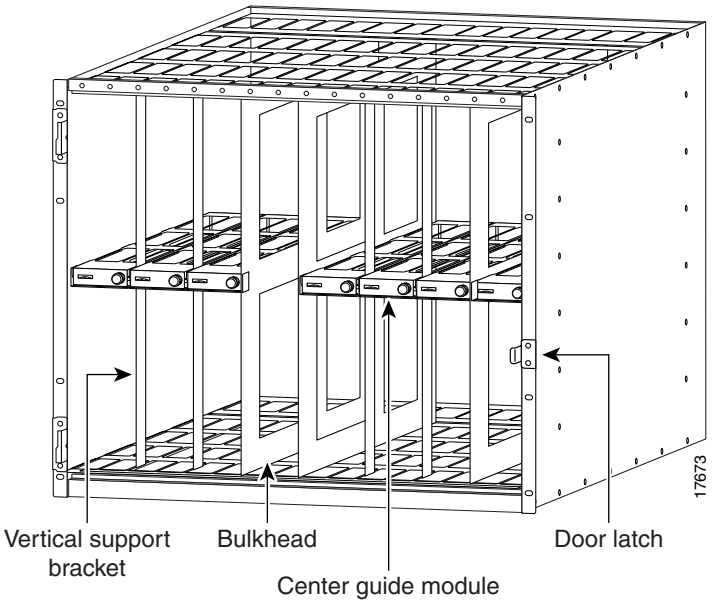
If a center guide module is removed from the rear and one double-height back card is installed, install a double-height blank faceplate in the gap adjacent to the installed double-height card. Two single-height blank faceplates cannot be used, because they require being screwed into the center guide module that was just removed.

Center guide modules, also called slot divider assemblies, are Cisco part number MGX 8850-SLOTDVDR=.

A center guide module consists of a two pieces—a vertical support bracket secured in place by a captive screw, and a horizontal center guide secured by its own jack screw. In the following procedure, Step 2 through Step 4 are for removal of the vertical support bracket, and Step 5 through Step 6 are for removal of the horizontal center guide.

Note When removing center guide modules, remove them sequentially, starting from the left and working toward the right.

Figure 6-7 Center Guide Module Position in an MGX 8850 or MGX 8950 Chassis



Caution Even though most portions of the vertical guide brackets are insulated, it is recommended that you turn off the power before removing the center guide modules. If you remove the center guide modules while the power is on, you may short out the adjacent cards by making contact with the non-insulated leg ends of a vertical support bracket.

Complete the following steps to remove the center guide modules:

Step 1 Connect a grounding strap to the ESD grounding jack or to the equipment rack.

Step 2 Loosen the captive screw from the vertical support bracket (see Figure 6-8) using the appropriate screwdriver.

Step 3 Carefully pull the bracket toward you.

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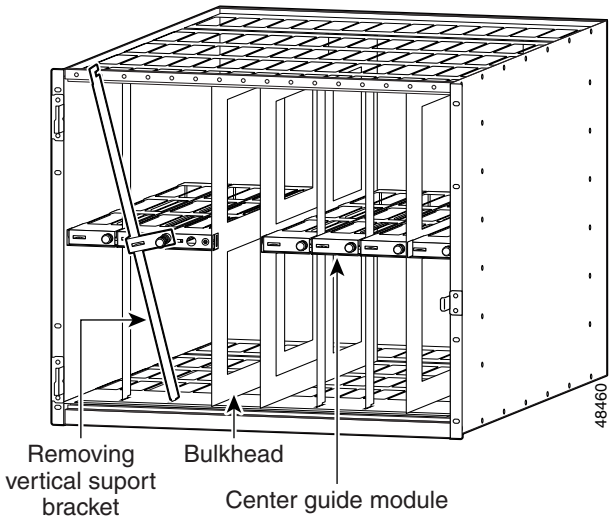
Figure 6-8 Removal of the Center Guide Module



Step 4 Carefully push the vertical support bracket straight downward approximately 1/2 inch, tilt the top leg of the support toward you until it clears the top of the card cage, and then pull the bracket to remove it from the card cage.

Step 5 Locate the jack screw (see Figure 6-9) behind the hole in the faceplate of the center guide module. Use a flat-blade screwdriver to loosen the jack screw at least five complete rotations counterclockwise to disengage the module from the card cage.

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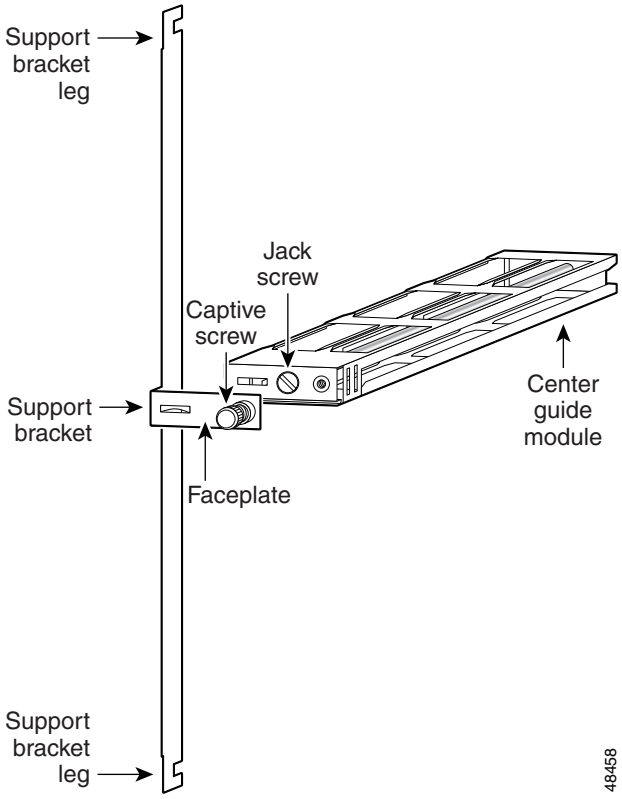
Figure 6-9 Guide Module Support Bracket



Step 6 Slide the center guide module carefully from the card cage.

Step 7 Repeat Step 2 through Step 6 until you have removed the desired number of center guide modules.

Connecting the Back Cards to the APS Connector

Complete the following steps to connect the back cards to an APS connector. When the back cards are installed in an APS connector, an APS assembly is formed. This procedure applies to all chasssis types, using illustrations for the Cisco MGX 8830. For more information about other APS connector types, refer to the following sections:

- MGX 8850, MGX 8850/B, and MGX 8880: "APS Assembly" section on page 1-28
- MGX 8950: "APS Assembly" section on page 1-41
- MGX 8830 and MGX 8830/B: "APS Assembly" section on page 1-52

For more information about APS line redundancy and compatibility information, see Chapter 4, "Planning for Card Redundancy, Line Redundancy, and Bulk Distribution"

Step 1 Connect a grounding strap to the ESD grounding jack or to the equipment rack.

Step 2 Position the edge of the back card in the alignment slot of the APS connector and use the guide tabs on the APS connector to align the holes on the back card with the pins on the APS connector. (See Figure 6-10.)

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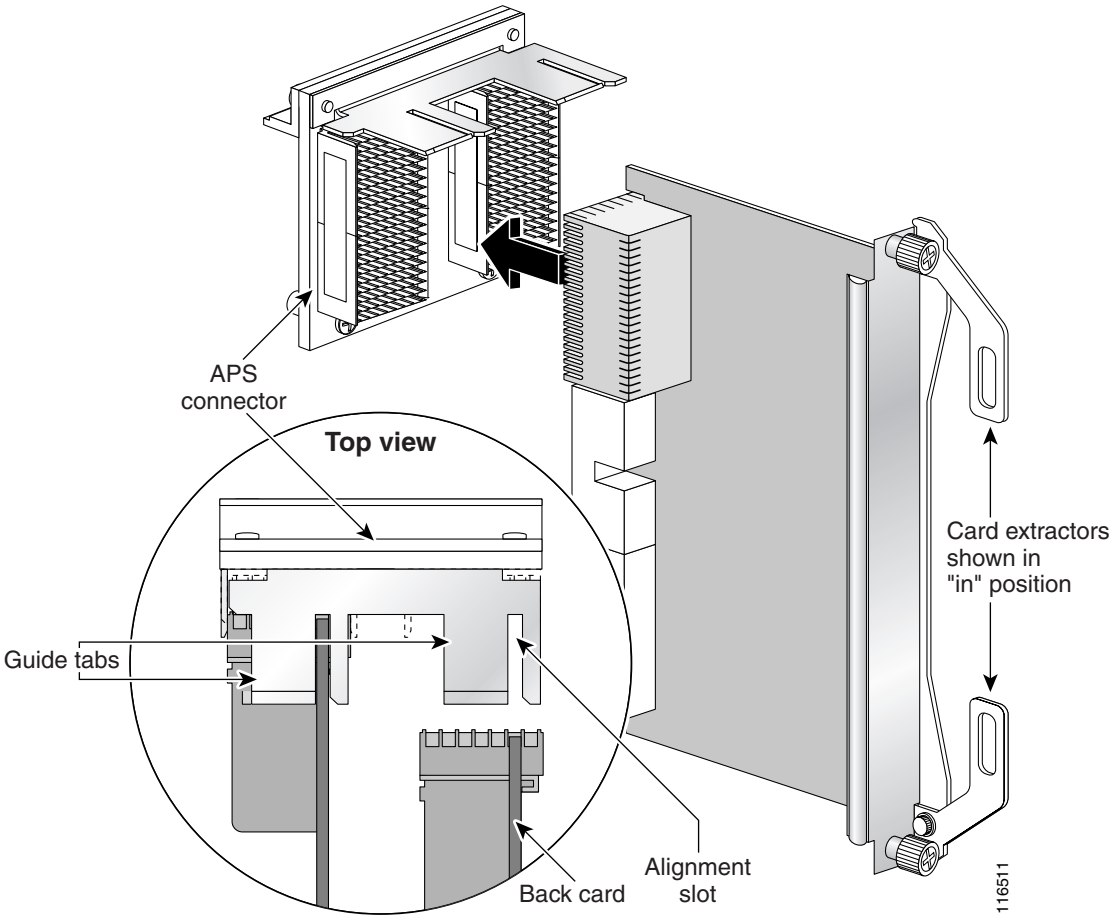
Figure 6-10 Connecting the Back Card to the APS Connector (MGX 8830 Example)



Step 3 Carefully install the back card in the APS connector by pushing firmly, with a straight motion, until the back card is securely connected.

Caution Do not rock the cards when mating them to the connector. Doing so can bend or damage the APS connector pins.

Step 4 Repeat Step 2 and Step 3 to install a second back card on the APS connector. Figure 6-11 shows two back cards installed in the APS connector.

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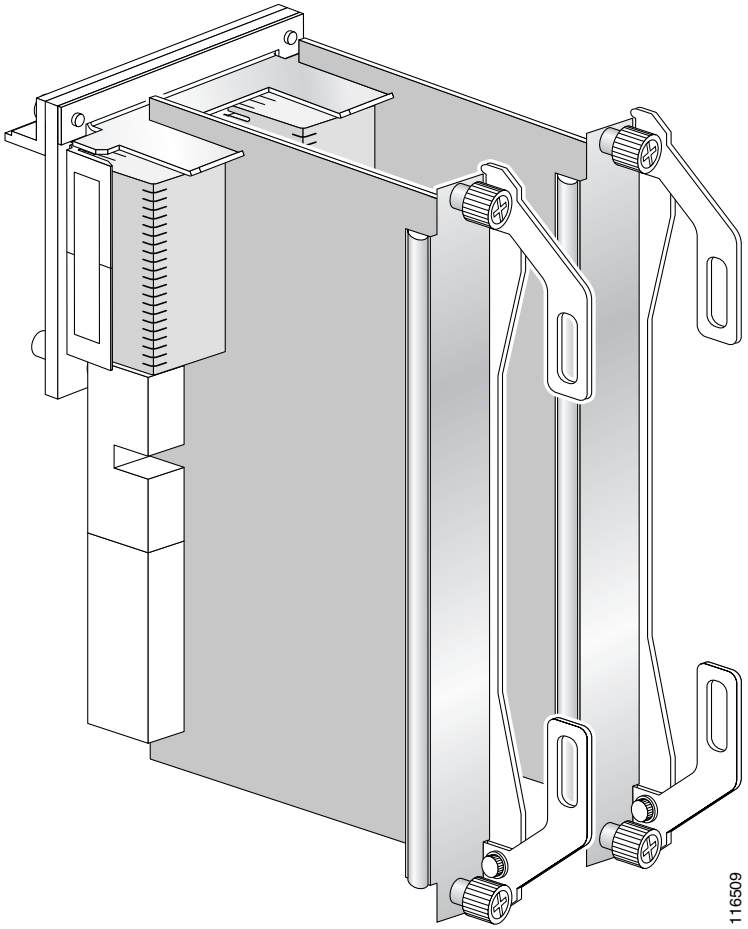
Figure 6-11 Two Back Cards Installed in the APS Connector (MGX 8830 Example)



Installing the APS Assembly in the Switch

An APS assembly consists of two back cards (a primary card and a secondary card), which are connected by an APS connector:

- The MGX 8830 APS connector is Cisco Part Number MGX-8830-APS-CON.
- The APS connectors used with the MGX 8850 (PXM1E) and MGX 8850 (PXM45) switches are Cisco Part Number MGX-8850-APS-CON or MGX-APS-CON. See Table 1-6 for compatibility details.
- The MGX 8950 APS connector is Cisco Part Number MGX-APS-CON-8950.

Complete the following steps to install the APS assembly in the Cisco switch. The steps apply to all switches unless otherwise noted.

Step 1 Connect a grounding strap to the ESD grounding jack or to the equipment rack.

Step 2 Verify that the back cards are securely connected to the APS connector.

Step 3 **For MGX 8830 only:** Use a screwdriver to remove the filler bar and screws, as shown in Figure 6-12.

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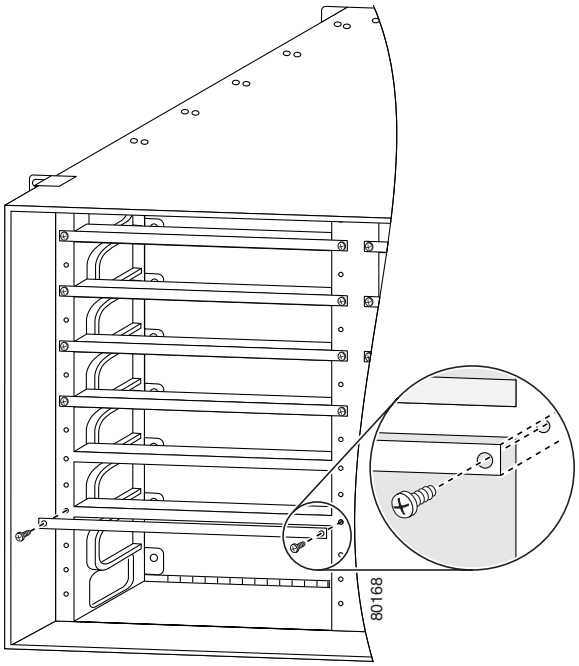
Figure 6-12 Removing the Filler Bar (MGX 8830)



Step 4 Connect a grounding strap to the ESD grounding jack or to the equipment rack.

Step 5 Verify that the back cards are securely connected to the APS connector.

Step 6 Position the APS assembly in the appropriate card slots.

Note The extractor levers must be closed (flush with the vertical edge of the back cards, as shown in Figure 6-10 and Figure 6-11), or the APS assembly will not slide into the chassis properly.

Step 7 Slide the APS assembly all the way into the slot until it is properly seated in the backplane. The faceplates of the back cards are flush with the card cage when the APS assembly is properly seated.

Step 8 Reattach the filler bars, to provide EMI containment.

Step 9 Tighten the captive screws on the back cards with the appropriate screwdriver. If you have difficulty inserting the captive screws, verify that the screws are aligned with the holes.

Step 10 Refer to the appropriate software configuration guide for commands to verify that the APS connector is installed properly.

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Removing the Back Cards from an APS Assembly

Complete the following steps to remove back cards from an APS assembly and to remove the APS connector from the card compartment.

Caution Do not use a power screwdriver on captive screws.

Do not rock a card when removing it from a connector. Doing so can bend or damage the APS connector pins.

Step 1 Connect a grounding strap to the ESD grounding jack or to the equipment rack.

To remove one of the back cards connected to the APS assembly:

Step 2 Use the flat-head or Phillips tip of the 3-in-1 tool to loosen the two captive screws located on the top and bottom of the back card faceplate.

Step 3 Pull each of the two extractor levers, located at the top and bottom of the faceplate, out to the horizontal position.

Step 4 Pull evenly on the two extractor levers to remove the back card from the APS connector.

Step 5 Repeat 2 through Step 4 for the remaining back card in the APS connector. The APS connector will still be connected to the second back card when it is removed and will come out of the card compartment with the card.

Step 6 Carefully separate the second back card from the APS connector by pulling it out with a straight motion.

Step 7 Place the back cards and APS connector in antistatic bags or on an antistatic bench.

Step 8 Repeat through Step 4 for any remaining APS assemblies.

Replacing Processor Cards

With the availability of MGX Release 4.0.00, you might want to replace a PXM45 or PXM45/B processor card with a PXM45/C processor cards. Or you might want to upgrade a PXM1E-4-155 card to a PXM1E-8-155 card. Both of these procedures are described in the *Cisco MGX 8800/8900 Series Configuration Guide, Release 5.2*. To find that manual online, go to www.cisco.com and search for the part number.

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Installing or Removing Redundancy Connectors

Redundancy connectors (RCON) provide 1:N redundancy for MPSM-16-T1E1 cards in MGX 8850/B and MGX 8830/B switches.

The following types of RCONs are available:

- RCON-1TO5-8850—1:5 redundancy for the MGX 8850/B
- RCON-1TO3-8850—1:3 redundancy for the MGX 8850/B
- RCON-1TO3-8830—1:3 redundancy for the MGX 8830/B

Note The MGX 8850 and MGX 8830 do not support RCONs.

When to Install or Remove RCONs

Normally, you don't need to install or remove RCONs. If you ordered MGX 8850/B or MGX 8830/B switch with RCONs, they are preinstalled before delivery. However, you might change RCONs under the following circumstances:

- Install RCONs to create another 1:N redundancy group of MPSM-16-T1E1 cards.
- Remove RCONs to make room for an APS redundancy connector.
- Move RCONs to a different location than the factory-installed default.
- Restore RCONs after backplane replacement.

Installing MGX 8850/B Redundancy Connectors

Warning **You must remove power from the MGX 8850/B switch before installing RCONs. Exposed connector pins near the RCON have hazardous voltages.**

To install RCONs in the MGX 8850/B chassis, perform the following steps:

Step 1 Verify that you have an MGX 8850/B chassis. A simple check is to open a configuration session and enter the **dspcd** command. The second line displays the chassis type.

Step 2 Power down the MGX 8850/B switch, either at the AC power supply or DC power source.

Step 3 If the MGX 8850/B has back cards installed where you want to install RCONs, remove them. For each card, perform the following steps:

a. Use the flat-head or Phillips tip of the 3-in-1 tool to loosen the two captive screws located on the top and bottom of the back card faceplate.

b. Pull each of the two extractor levers, located at the top and bottom of the faceplate, out to the horizontal position.

c. Pull evenly on the two extractor levers to remove the back card from the APS connector.

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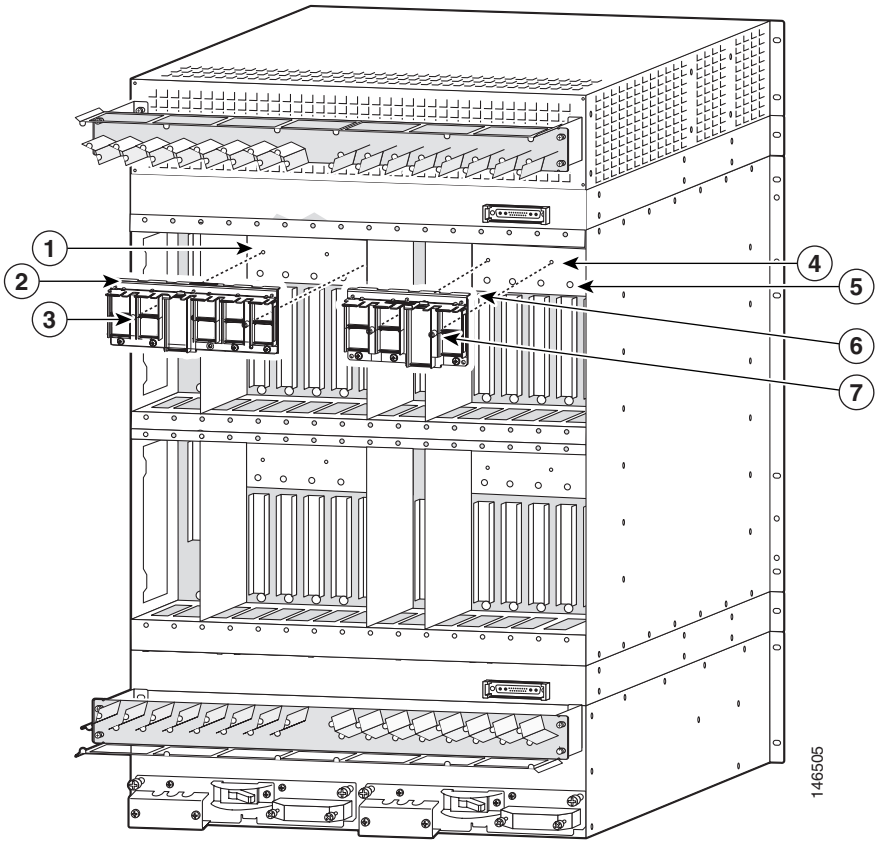
Step 4 Place the RCON assembly over the RCON mounting bar, positioning the RCON alignment flange over the top edge of the bar and the RCON alignment pins through holes in the bar (See Figure 6-13).

- If you are installing the 1:5 RCON, there is a single mounting position on the mounting bar.
- If you are installing the 1:3 RCON, there are two mounting positions on the mounting bar, offset by one slot. The 1:3 RCON in Figure 6-13 is shown in the left-hand mounting location.

Note Be careful not to bend or damage the pins on nearby back card connectors.

Figure 6-13 MGX 8850/B RCON Installation



1	Mounting bar for RCON	**5**	Alignment holes for RCON
2	Alignment flange on 1:5 RCON assembly	**6**	Alignment flange on 1:3 RCON assembly
3	Mounting screw on 1:5 RCON assembly	**7**	Mounting screw on 1:3 RCON assembly
4	Left mounting location for 1:3 RCON		

Step 5 Tighten the two RCON fasteners, first by hand and then using a screwdriver.

Step 6 Install additional RCONs, if desired. You can install up to four RCONs, on the left and right-hand side of the top and bottom bay.

Step 7 Reinstall all back cards.

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Step 8 Restore power to the MGX 8850/B.

Installing MGX 8830/B Redundancy Connectors

Warning **You must remove power from the MGX 8830/B switch before installing RCONs. Exposed connector pins near the RCON have hazardous voltages.**

To install RCONs in an MGX 8830/B chassis, perform the following steps:

Step 1 Verify that you have an MGX 8830/B chassis. A simple check is to open a configuration session and enter the **dspcd** command. The second line displays the chassis type.

Step 2 Remove power to the chassis, either at the AC power supply or DC power source.

Step 3 If the MGX 8830/B has back cards installed, remove them.

a. Use the flat-head or Phillips tip of the 3-in-1 tool to loosen the two captive screws located on the top and bottom of the back card faceplate.

b. Pull each of the two extractor levers, located at the top and bottom of the faceplate, out to the horizontal position.

c. Pull evenly on the two extractor levers to remove the back card from the APS connector.

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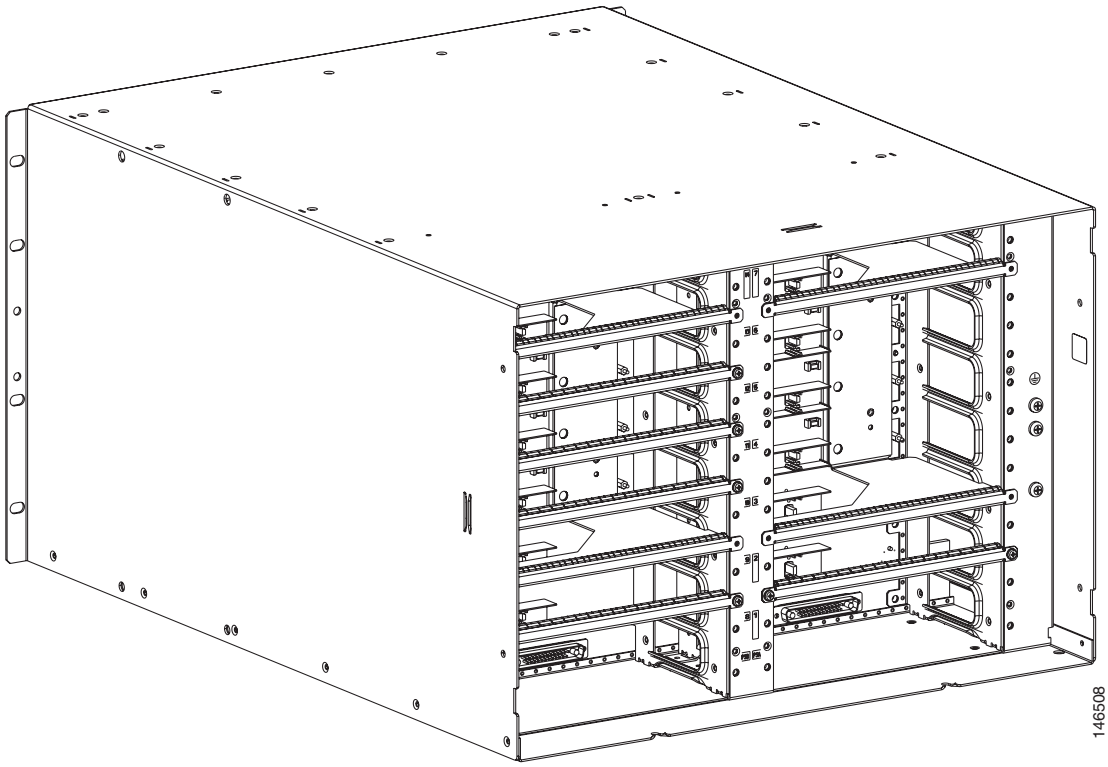
Step 4 Remove the three filler bars between slots 3 through 6 on right bay (See Figure 6-14), or slots 10 through 13 on the left bay. To remove each filler bar, loosen and remove the screws on each end of the divider.

Figure 6-14 MGX 8830/B With Filler Bars Removed



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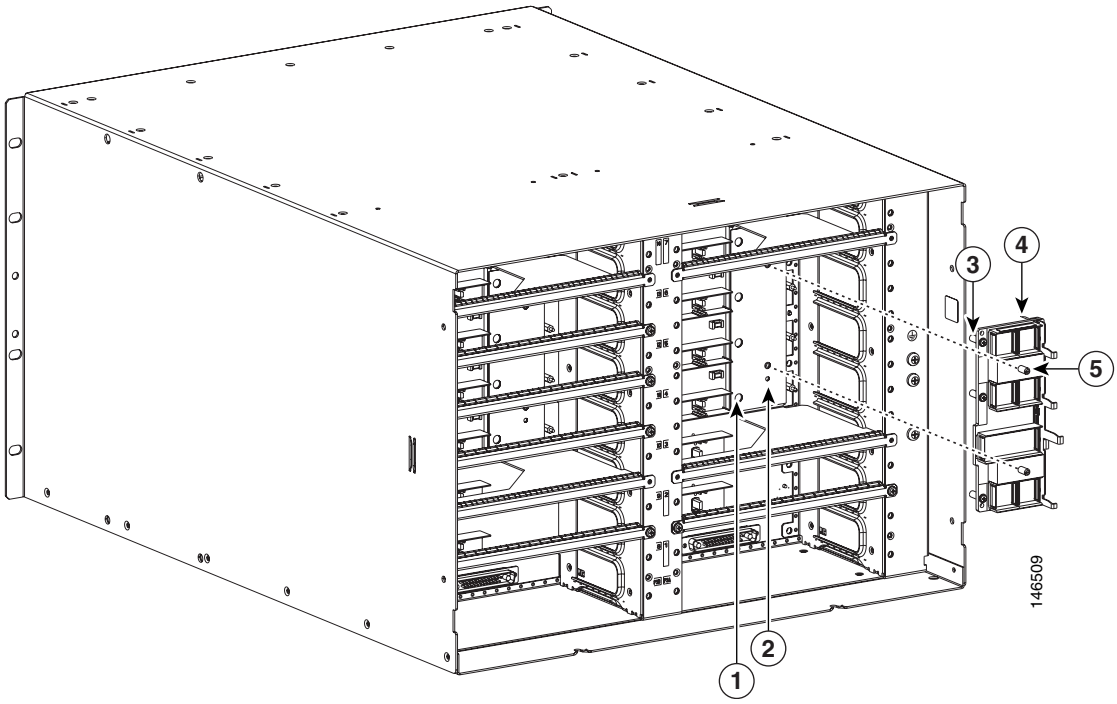
Step 5 Place the RCON assembly over the RCON mounting bar, positioning the RCON alignment flange over the right of the bar and the RCON alignment pins through holes in the bar; then tighten the two fasteners (See Figure 6-15).

Note Be careful not to bend or damage the pins on nearby back card connectors.

Figure 6-15 MGX 8830/B RCON Installation



1	Alignment hole for RCON	**5**	Alignment flange on RCON assembly
2	Mounting flange for RCON	**6**	Mounting screw on RCON assembly
3	Alignment pin on RCON assembly		

Step 6 Install a second RCON in the other bay, if desired.

Step 7 Reinstall all filler bars.

Step 8 Reinstall all back cards.

Step 9 Restore power.

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Removing Redundancy Connectors

Warning **Remove power from the MGX 8850/B or MGX 8830/B switch before removing RCONs. Connector pins near the RCON have hazardous voltages.**

To remove RCONs, perform the following steps:

Step 1 Remove power to the chassis, either at the AC power supply or DC power source.

Step 2 At the back of the chassis, remove back cards over the RCON.

Step 3 Remove the filler bars over the RCON. (MGX 8830/B only)

Step 4 Unscrew the RCON fasteners and lift the RCON off the mounting bar.

Step 5 Replace the filler bars. (MGX 8830/B only)

Step 6 Reinstall back cards.

Step 7 Restore power.

Installing and Removing the AXSM-XG Extender Connector

The extender connector (MGX8950-EXTDR-CON) extends additional serial lines from the AXSM-16-155-XG and AXSM-8-622-XG cards to the MGX 8950 backplane. Install or remove the extender connector, as necessary, to satisfy the following requirements:

- Cisco MGX 8950—The MGX8950-EXTDR-CON *must* be installed on AXSM-16-155-XG and AXSM-8-622-XG cards. The cards require the extender connector for proper operation.
- Cisco MGX 8850 or Cisco MGX 8830—The MGX8950-EXTDR-CON *must not* be installed on AXSM-16-155-XG and AXSM-8-622-XG cards. The extender connector can damage the backplane.

Note Remember to observe antistatic precautions when handling circuit boards. These precautions include using grounded wrist straps, antistatic bags, and antistatic work surfaces.

Installing the Extender Connector

To install the extender connector:

Step 1 Place the AXSM-16-155-XG or AXSM-8-622-XG card on a flat antistatic surface.

Step 2 Locate an extender connector (MGX8950-EXTDR-CON) and mounting hardware. Usually, the mounting screws and washers are attached to the connector itself. If they are, remove them.

Step 3 Insert the extender connector into the connector on the AXSM-16-155-XG or AXSM-8-622-XG card edge (see Figure 6-16).

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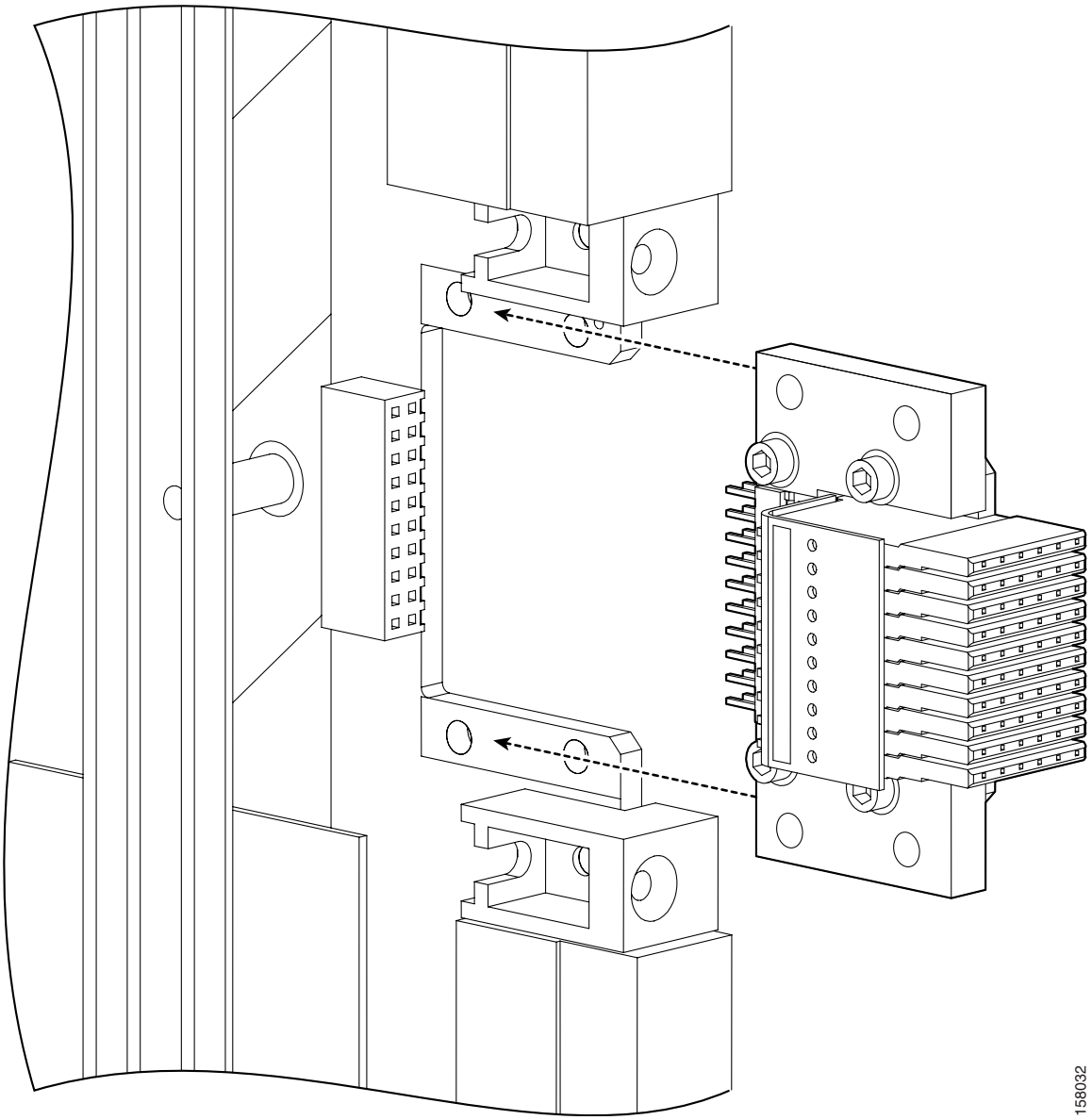
Figure 6-16 MGX8950-EXTDR-CON Installation



Step 4 Insert the mounting screws, with lock washers, from the bottom of the circuit board, through the board, and into the extender connector. The extender connector has captive nut that accepts the mounting screws (see Figure 6-17).

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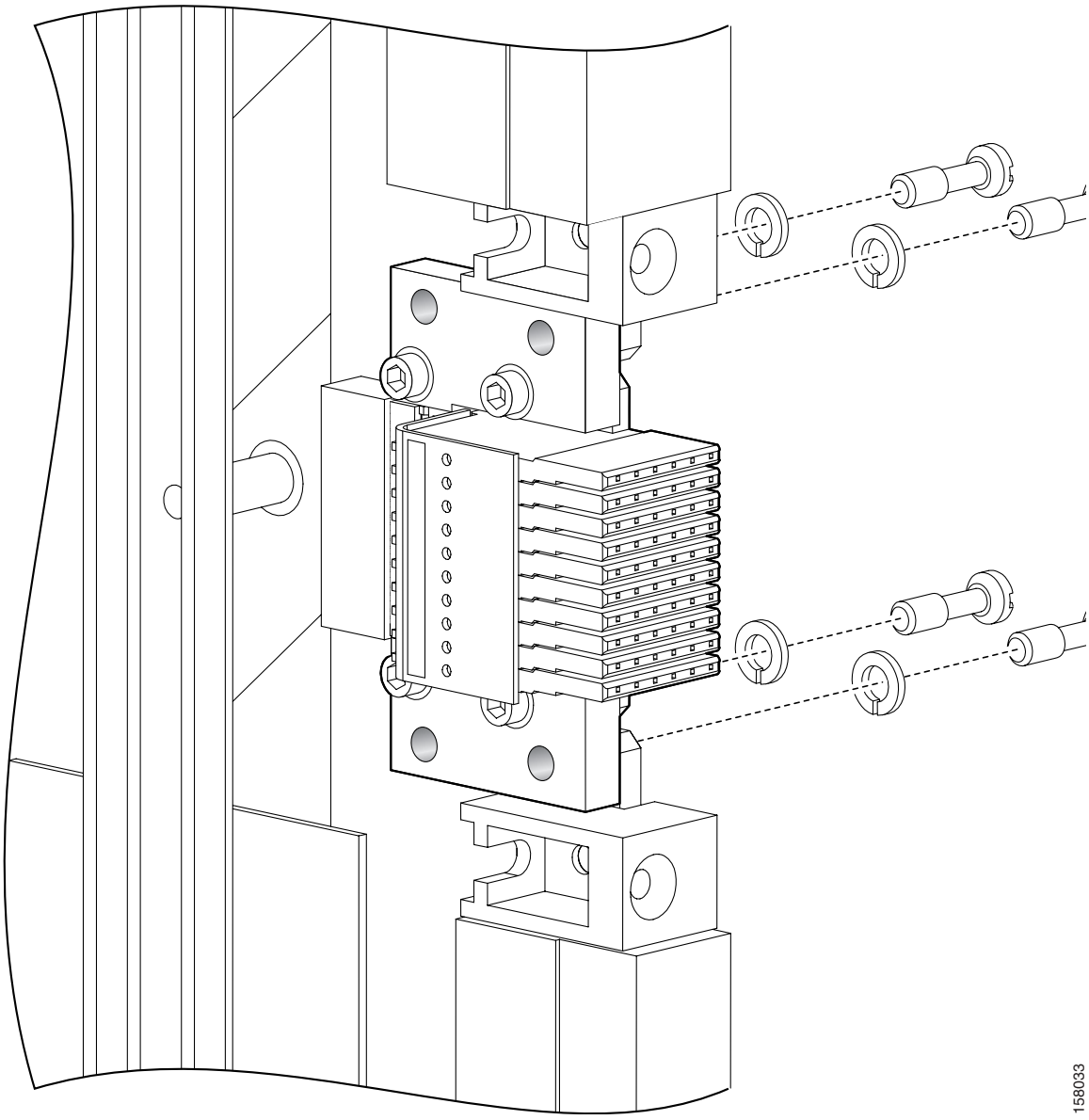
Figure 6-17 MGX8950-EXTDR-CON Assembly



Step 5 Tighten the four mounting screws.

Removing the Extender Connector

To install the extender connector:

Step 1 Remove the four mounting screws and washers from the extender connector.

Step 2 Remove the extender connector from the board.

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Step 3 Save the extender connector and hardware for possible future use with MGX 8950 switches.

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Front Card Specifications

This appendix provides technical specifications for cards used in Cisco MGX 8950, Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8850/B, Cisco MGX 8830 and Cisco MGX 8830/B switches and the Cisco MGX 8880 Media Gateway. It contains the following sections:

- Single-Height Service Module Specifications, page A-2. These service modules include:
  - AUSM
  - CESM
  - FRSM
  - MPSM
  - VISM-PR
- Double-Height Service Module Specifications, page A-2. These service modules include:
  - AXSM
  - FRSM-12-T3E3
  - VXSM
- PXM1E Specifications, page A-3
- PXM45 Specifications, page A-5
- RPM-PR Specifications, page A-7
- RPM-XF Specifications, page A-8
- SRM Specifications, page A-8

Note For information on site and safety requirements, see Chapter 3, "Preparing for Installation." Also refer to the *Regulatory Compliance and Safety Information for Cisco Multiservice Switch Products (MGX, BPX, and SES)* booklet that shipped with your chassis for standards and compliance information.

The information in this guide does not apply to the MGX 8850 (PXM1) switch. For information on that switch, refer to the documentation at http://www.cisco.com/univercd/cc/td/doc/product/wanbu/mgx8850/index.htm.

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Single-Height Service Module Specifications

Table A-1 lists the physical specifications for the following single-height service modules:

- AUSMs
- CESMs
- FRSMs
- MPSM
- VISM-PRs

Table A-1 Single-Height Service Module Physical Specifications

Specification	Description
Dimensions for single-height service modules	Height: 7.25 in. (18.42 cm) Depth: 16.25 in. (41.28 cm)
Dimensions for back cards	Height: 7.00 in. (17.78 cm) Depth: 4.50 in. (11.43 cm)
Weight for single-height service modules	1.74 lb (0.79 kg)
Weight for back cards	Card-dependent
External interfaces	1 to 8 for MPSM-8-T1E1 1 to 3 for MPSM-T3E3-155 1 to 16 for MPSM-16T1E1
Power	–48 VDC
Maximum power consumption	See Table 3-6, Table 3-13, Table 3-20, Table 3-28
Maintenance and serviceability	• Internal loopbacks (managed by the software) • Hot swappable
Network management	• Cisco WAN Manager • CLI • Standards-based SNMP

Double-Height Service Module Specifications

Table A-2 lists the physical specifications for the following double-height service modules:

- AXSM
- FRSM-12-T3E3
- VXSM

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Table A-2 Double-Height Service Module Physical Specifications

Specification	Description
Dimensions for double-height service modules	Height: 15.65 in. (39.75 cm) Depth: 16.25 in. (41.28 cm)
Dimensions for back cards	Height: 7.00 in. (17.78 cm) Depth: 4.50 in. (11.43 cm)
Weight for double-height service modules	Varies by card (VXSM modules are 7.5 lb. or 3.4 kg, for example)
Weight for back cards	Varies with the back card (VXSM back cards are 1 lb. or .45 kg, for example)
External interfaces	1 to 32 (no connectors on the double-height service module)
Environmental	–32 to 104 F (0 to 40 C) for normal operation Operating humidity (non-condensing): 10 to 85 percent
Power	–48 VDC
Maximum power consumption	See Table 3-6 and Table 3-13
Maintenance and serviceability	• Internal isolation loopback (managed by the software) • External remote loopback (managed by the software) • Hot-swappable
Network management	• Cisco WAN Manager • CLI • Standards-based SNMP

PXM1E Specifications

Table A-3 lists the physical and technical specifications for the PXM1E, the user interface back card, and the NNI/UNI back card.

Table A-3 PXM1E Specifications

Specification	Description
Dimensions for PXM1Es	Height: 15.65 in. (39.75 cm) Depth: 16.25 in. (41.28 cm)
Dimensions for back cards	Height: 7.00 in. (17.78 cm) Depth: 4.50 in. (11.43 cm)
Weight for PXM1Es	4.80 lb (2.18 kg)
Weight for back cards	Card dependent

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Table A-3 PXM1E Specifications (continued)

Specification	Description
Processor clock speed and memory specifics	Clock speed: 350 MHz internal, 100 MHz external Flash memory: 2 MB DRAM: 256 MB Tertiary cache: 2 MB External L3 cache: 2 MB Secondary cache: 256 KB BRAM[1]: 512 KB DRAM: 256 MB Hard disk: 6 to 20 GB CPU: R7000
Maximum switch fabric throughput	1.2 Gbps
Control access **Note** These ports exist on the user interface back cards.	• Control port: RJ-45 receptacle, EIA/TIA-232, DTE mode, asynchronous interface, 19,200 baud, 1 start bit, 1 stop bit, no parity bits • Maintenance port: RJ-45 receptacle, EIA/TIA-232, DTE mode, asynchronous interface, 19,200 baud, 1 start bit, 1 stop bit, no parity bits • LAN port: RJ-45 receptacle, 10BASE-T, 802.3 Ethernet • Two serial ports for the following: – PNNI modem port – IOS control port – IOS modem port
Number of logical ports	32 logical ports across all physical ports on the NNI/UNI port back card (regardless of line type)
Alarm indicators (audible and visual)	Central office-compatible alarm indicators and controls through a DB-15 receptacle
BITS[2] clock interface	T1 and E1 with an RJ-48 receptacle
Stratum 3 synchronization (internal and external)	• Free-run accuracy of ±4.6 ppm (±7 Hz at 1.544 MHz) • Holdover stability of less than 255 slips (±.37 ppm) for the initial 24 hours of holdover • Upon clock switchover, MTIE[3] does not exceed 1 microsecond and rate of phase change does not exceed 81 ns[4] in a 1.326-ms interval • Pull-in range of accuracy ±4.6 ppm • Provides jitter filtering and tolerance according to AT&T T1.5 and ITU G.824 specifications • Declares a bad reference if LOS detected > 50 ms or error burst of duration > 2.5 sec.

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Table A-3 PXM1E Specifications (continued)

Specification	Description
Power	–48 VDC
Maximum power consumption	See Table 3-6 for MGX 8850 (PXM1E) and Table 3-20 for MGX 8830.
Maintenance and serviceability	• Internal isolation loopback (managed by the software) • External remote loopback (managed by the software) • Hot-swappable
Network management	• Cisco WAN Manager • CLI • Standards-based SNMP

1. BRAM = battery RAM
2. BITS = building integrated timing supply
3. MTIE = maximum time interval error
4. ns = nanosecond

PXM45 Specifications

Table A-4 lists the physical and technical specifications for the PXM45, the user interface back card, and the PXM-HD back card.

Table A-4 PXM45 Specifications

Specification	Description
Dimensions for PXM45s	Height: 15.65 in. (39.75 cm) Depth: 16.25 in. (41.28 cm)
Dimensions for back cards	Height: 7.00 in. (17.78 cm) Depth: 4.50 in. (11.43 cm)
Weight for PXM45s	4.80 lb (2.18 kg)
Weight for back cards	Card dependent

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Table A-4 PXM45 Specifications (continued)

Specification	Description
Processor clock speed and memory specifics	Clock speed: 350 MHz internal, 100 MHz external Flash memory: 2 MB DRAM: 256 MB • PXM45, introduced October 2000, with MGX Release 2 software and 128 MB RAM • PXM45/B, introduced October 2001, with MGX Release 2.1 software and 256 MB RAM • PXM45/C, introduced April 2003, with MGX Release 4.0 software and 512 MB RAM. Tertiary cache: 2 MB Secondary cache: 256 KB BRAM: 512 KB Hard disk: 6 GB
Maximum switch fabric throughput	45 Gbps
Control access **Note** These ports exist on the user interface back cards.	• Control port: RJ-45 receptacle, EIA/TIA-232, DTE mode, asynchronous interface, 19,200 baud, 1 start bit, 1 stop bit, no parity bits • Maintenance port: RJ-45 receptacle, EIA/TIA-232, DTE mode, asynchronous interface, 19,200 baud, 1 start bit, 1 stop bit, no parity bits • LAN port: RJ-45 receptacle, 10BASE-T, 802.3 Ethernet
Controller access port **Note** This port exists on the PXM-HD back card.	Connector: OC-3 SC
Alarm indicators (audible and visual)	Central office-compatible alarm indicators and controls through a DB-15 receptacle
BITS clock interface	T1 and E1 with an RJ-48 receptacle
Synchronization **Note** These clock sources satisfy Stratum 3 requirements	8-kHz clock derived from the following sources: • Internal 8-kHz clock (±4.6 ppm) • Recovered clock from service modules or trunk line interfaces • External BITS clock port
Power	–48 VDC
Maximum power consumption	See Table 3-6

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Table A-4 PXM45 Specifications (continued)

Specification	Description
Maintenance and serviceability	• Internal isolation loopback (managed by the software) • External remote loopback (managed by the software) • Hot-swappable
Network management	• Cisco WAN Manager • CLI • Standards-based SNMP

RPM-PR Specifications

Table A-5 lists the physical specifications for the RPM-PRs.

Table A-5 RPM-PR Physical Specifications

Specification	Description
Dimensions for RPM-PRs	Height: 7.25 in. (18.42 cm) Depth: 16.25 in. (41.28 cm)
Dimensions for back cards	Height: 7.00 in. (17.78 cm) Depth: 4.50 in. (11.43 cm)
Weight for RPM-PRs	4.80 lb (2.18 kg)
Weight for back cards	Card dependent
Power	–48 VDC
Maximum power consumption	See Table 3-6 for MGX 8850 (PXM1E and PXM45), Table 3-20 for MGX 8830, and Table 3-13 for MGX 8950.
Maintenance and serviceability	• Internal loopbacks (managed by the software) • Hot swappable
Network management	• Cisco WAN Manager • CLI • Standards-based SNMP

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RPM-XF Specifications

Table A-6 lists the physical specifications for the RPM-XFs.

Table A-6 RPM-XF Specifications

Specification	Description
Dimensions for RPM-XFs	Height: 15.65 in. (39.75 cm) Depth: 16.25 in. (41.28 cm)
Dimensions for back cards	Height: 7.00 in. (17.78 cm) Depth: 4.50 in. (11.43 cm)
Weight for RPM-XFs	6.75 lb (3.06 kg)
Weight for back cards	0.75 lb (0.34 kg)
Processor	400-MHz RM7000A RISC
Cell bus interface speed	OC-3
Serial interface speed	OC-24
Memory	Up to 512 MB DRAM, up to 64 MB Flash
Console port	Configuration port: asynchronous interface speed based on config-register up to 115200 baud; EIA/TIA-232 serial port
Auxiliary port	Maintenance port: asynchronous interface speed configurable up to 9600 baud; EIA/TIA-232 serial port
Power	–48 VDC
Maximum power consumption	See Table 3-6 for MGX 8850 (PXM45) and Table 3-13 for MGX 8950.
Maintenance and serviceability	• Internal loopbacks (managed by the software) • Hot swappable
Network management	• Cisco WAN Manager • CLI • Standards-based SNMP

SRM Specifications

Table A-7 lists the physical specifications for the SRMs.

Table A-7 SRM Physical Specifications

Specification	Description
Dimensions for SRMs	Height: 7.25 in. (18.42 cm) Depth: 16.25 in. (41.28 cm)
Dimensions for back cards	Height: 7.00 in. (17.78 cm) Depth: 4.50 in. (11.43 cm)

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Table A-7 SRM Physical Specifications (continued)

Specification	Description
Weight for SRMs	1.74 lb (0.79 kg)
Weight for back cards	Card-dependent
External interfaces	Back card dependent
Power	–48 VDC
Maximum power consumption	See Table 3-6 for MGX 8850 (PXM1E and PXM45) and Table 3-20 for MGX 8830.
Maintenance and serviceability	• Hot swappable

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Cable Specifications

This appendix provides cable requirements and pin assignments for cables used with Cisco MGX 8850 (PXM1E/PXM45), Cisco MGX 8850/B, Cisco MGX 8950, Cisco MGX 8830 and Cisco MGX 8830/B multiservice switches and the Cisco MGX 8880 Media Gateway.

This appendix contains the following sections:

- Notes about Cables and Connectors, page B-1
- Control and Clock Cabling, page B-3
- External Alarm Cabling, page B-9
- Power Cabling, page B-11
- Redundancy Y-Cable, page B-14
- Trunk Cabling, page B-16
- Frame Relay Cabling, page B-17
- Illustrated Cable Guide, page B-25

Note The information in this guide does not apply to the Cisco MGX 8850 (PXM1) switch. For MGX 8850 (PXM1) cable information, refer to *Cisco MGX 8850 Edge Concentrator Installation and Configuration, Release 1.1.3* located at:
http://www.cisco.com/univercd/cc/td/doc/product/wanbu/mgx8850/1_1_31/instconf/index.htm

Notes about Cables and Connectors

This section contains general explanations about Cisco MGX cables.

Warning **For NEBS Level 3 compliance to GR-1089 (Second-Level Lightning Surge and Intra-building AC Power Fault Requirements), shielded cables, grounded at both ends, must be used on all metallic interfaces.**

In all cable references, the transmit (Tx) direction is away from the system, and the receive (Rx) direction is toward the system.

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Cable and Connector Naming Conventions

The suffix to the model number indicates the length of the cable. For example, 5610-50 indicates a 50-foot cable. Sometimes the suffix indicates the cable length in inches, rather than feet. This typically occurs on Y-cables or adaptor cables.

Some entries in the cable tables include the gender of the connector and the number of pins. For example, EIA/TIA-232/M25-M25 indicates a cable terminated with a male DB-25 connector at each end.

Cable Lengths

Cables are available in standard lengths of 10 feet (3 meters), 25 feet (7.6 meters), 50 feet (15 meters), 75 feet (22.8 meters), and 100 feet (30 meters). Lengths of 100 feet (30 meters) to 600 feet (183 meters) can be specially ordered.

Standard Cisco MGX 8850 (PXM1E/PXM45), MGX 8850/B, and MGX 8880 Cables

The standard cables that Cisco can supply for the Cisco MGX 8850 (PXM1E/PXM45) and MGX 8850/B systems appear in Table B-1.

Table B-1 Standard Cisco MGX 8850 and MGX 8850/B Cables Available from Cisco

Model Number	Description	Usage
CAB-T3E3-PL-AD	75 ohms coax/SMB-BNC	T3 or E3 trunk interface
	ASSY CBL SMB (M) to BNC (F)	T3 or E3 trunk interface
	T3/E3 SMB to SMB Posi-Lok	Redundant usage
CAB-T3E3-PL-AD-6	Posi-Lok SMB to BNC 6 Ad	T3 or E3 trunk interface
CAB-T3E3-PL-CE-AD	T3/E3 SMB-BNC Posi-Lok A	T3 or E3 trunk interface (International)
CAB-T3E3-PL-CE-Y	T3/E3 SMB-BNC Posi-Lok Y	Redundant usage (International)
CAB-SMB-BNC-Y	Posi-lok SMB to BNC Y Ca	Redundant usage
CAB-T3E3-PL-Y-6	Posi-lok SMB to BNC 6 Y	Redundant usage
CAB-MCC-T1E1 CAB-MCC-T1E1-Y	Mini-coaxial (MCC) to BNC cable	E1 interface E1 interface (Redundant usage)
CAB-RBBN-16-T1E1 CAB-RBBN-16-T1E1-Y	36-pin to 50-pin straight cable with RBBN connector	T1 or E1 interface T1 or E1 interface (Redundant usage)[1]
5620	EIA/TIA-232/M25-F25	PXM-UI-S3 maintenance port to control terminal, Cisco WAN Manager, or external window device
5621	EIA/TIA-232/M25-M25 special	Control or maintenance port to modem
	Ground cable (customer-supplied)	DC power. See Table B-13 for details.

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Table B-1 Standard Cisco MGX 8850 and MGX 8850/B Cables Available from Cisco (continued)

Model Number	Description	Usage
	Molex-pigtail (customer-supplied)	DC power. See Table B-13 for details.
	Spade lug-pigtail (customer-supplied)	DC power. See Table B-13 for details.

1. Two cables required per back card, one TX and one RX.

Standard Cisco MGX 8950 Cables

The standard cables that Cisco can supply for the Cisco MGX 8950 system appear inTable B-2.

Table B-2 Standard Cisco MGX 8950 Cables Available from Cisco

Model Number	Description	Usage
CAB-T3E3-PL-AD-6	75 Ω coax/SMB-BNC, 6 feet	T3 or E3 trunk interface
	ASSY CBL SMB(M) to BNC(F)	T3 or E3 trunk interface
	T3/E3 SMB to SMB Posi-Lok	Redundant usage
CAB-T3E3-PL-AD-6	Posi-lok SMB to BNC 6 Ad	T3 or E3 trunk interface
CAB-T3E3-PL-CE-AD	T3/E3 SMB-BNC Posi-lok A	T3 or E3 trunk interface
CAB-T3E3-PL-CE-Y	T3/E3 SMB-BNC Posi-lok Y	Redundant usage
CAB-SMB-BNC-Y	Posi-lok SMB to BNC Y Ca	Redundant usage
CAB-T3E3-PL-Y-6	Posi-lok SMB to BNC 6 Y	Redundant usage
5620	EIA/TIA-232/M25-F25	PXM-UI-S3 maintenance port to control terminal, Cisco WAN Manager, or external window device
5621	EIA/TIA-232/M25-M25 special	Control or maintenance port to modem
5601	Ground cable	DC power
5670	Molex-pigtail	DC power
5671	Spade lug-pigtail	DC power

Control and Clock Cabling

This section describes the cables that can connect to the PXM-UI-S3 or PXM-UI-S3/B user interface back card.

Maintenance and Control Ports

The maintenance (or modem) port and the control (or console) port connect a switch or gateway to an ASCII terminal, workstation, or modem for remote alarm reporting or system monitoring. These ports are labeled *MP* or *CP* on the user interface back card. See Figure 2-63 on page 2-121 and Figure 2-64 on page 2-122 for the locations of these ports. Table B-3 provides cabling details.

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Note The PXM-UI-S3/B user interface card does not have a maintenance port.

Procedure to Connect a Modem to the Maintenance Port

Table B-3 lists cable information for maintenance and control ports.

Table B-3 Cable and Connector Information for the Maintenance and Control Ports on the PXM-UI-S3 and PXM-UI-S3/B User Interface Cards

Cable Parameter	Description
Interface	EIA/TIA-232—both are DTE ports.
Suggested cable	**MGX 8950**: Uses only 8 conductor **MGX 8850 or MGX 8850/B**: 24 AWG, 25-wire. A straight-through EIA/TIA-232 cable provides a terminal or printer connection. For an interface with modems on either port, a null modem cable might be necessary. **MGX 8830 or MGX 8830/B**: 24 AWG, 8-wire. A straight-through EIA/TIA-232 cable provides a terminal or printer connection. For an interface with modems on either port, a null modem cable might be necessary.
Cable connector	**MGX 8850** and **MGX 8950: RJ-48**, subminiature, male. **MGX 8830: RJ-45**, subminiature, male.
Maximum cable length	50 feet (15.24 m).

Use the following procedure to properly connect a modem to a maintenance port.

Step 1 Connect the suggested cable from the modem to the maintenance port.

Step 2 Configure an IP address for the serial port (s10) and also a second unique address for the destination IP address.

Step 3 Using 9600 baud, connect to the modem. Use a serial line interface protocol (SLIP) client package that does not enable compression and also supports a configurable EOF character. The MGX switch expects to see an EOF character of *300* in base 8.

Step 4 Try to telnet or ping the destination IP address configured.

- If the correct SLIP client is used, you should see the login prompt when telnetting in.
- If incorrect, you can still verify connectivity is up by checking statistics on **dspipif** s10 for packets in.

If the special EOF character is not supported, then after 576 bytes, it is logged as an input error. (You should be able to connect directly from a PC or via modem as long as the correct SLIP client is used.)

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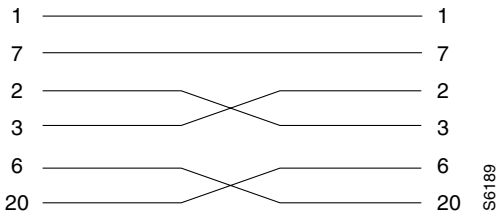
Null Modem Cable

Figure B-1 shows a null modem cable that is used for connecting modems to the control or maintenance ports on the PXM-UI-S3 and PXM-UI-S3/B User Interface Cards.

Figure B-1 Null Modem Cable



Pin Assignments for RJ-48 Maintenance and Control Ports

Table B-4 provides the pin assignments for the associated RJ-48 and RJ-45 connectors.

Table B-4 Pin Assignments for the RJ-48 Maintenance and Control Ports on the PXM-UI-S3 and PXM-UI-S3/B User Interface Cards

Pin No.	Name	Description
1	RTS out	Request to send
2	DTR out	Data terminal ready
3	TxD	Transmit data
4	GND	Chassis ground
5	GND	Chassis ground
6	RxD	Receive data
7	DSR	Data set ready
8	CTS	Clear to send

External Clock Input Cabling

This section explains the cabling that provides the MGX switch with an external clock source.

If external equipment or a local digital central office provides synchronization to the Cisco MGX switch, the external clock source is connected to the user interface back card (PXM-UI-S3 or PXM-UI-S3/B). The user interface back card has two external clock input ports labeled *EXT CLK1* and *EXT CLK2* that can support either T1 or E1 external clock input, but not both. That is, both *EXT CLK1* and *EXT CLK2* clocks must be set the same, either T1 **or** E1. The clock may be 1.544 Mbps or 2.048 Mbps. Refer to Table 2-44 on page 2-120 for information about which switch is compatible with which user interface back card, and see Figure 2-63 on page 2-121 and Figure 2-64 on page 2-122 for locations of the external clock ports.

The PXM-UI-S3 or PXM-UI-S3/B cards go into slots 7 and 8 for the following switches:

- MGX 8850 (PXM1E/PXM45) and MGX 8850/B
- MGX 8950

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The PXM-UI-S3 or PXM-UI-S3/B cards go into slots 1 and 2 for the MGX 8830 and MGX 8830/B switches.

For redundancy where one user interface back card is present, connect to both ports, using *EXT CLK1* as the primary source and *EXT CLK2* as the secondary source.

For redundant PXM configurations where two user interface back cards are present, use a Y-cable to connect to the *EXT CLK1* input of Slot 7 and the *EXT CLK1* input of Slot 8. For BITS source protection, connect another Y-cable to the *EXT CLK2* input of Slot 7 and the *EXT CLK2* input of Slot 8. (For MGX 8830 switches, these cards would be in slots 1 and 2.)

Cable Specifications for Y-Cables and Cable Adapters for Clocking

There are two types of Y-cables for clocking:

- One type has an RJ-45 plug at the single end, and RJ-45 connectors at the Y ends
- One type has a BNC coax connector at the single end, and RJ-45 connectors at the Y ends

Note In systems with redundant PXM cards and an external clock source, the single external clock source should be connected to both PXM-UI-S3 cards using a short Y-cable.

A wire-wrap adapter can be used for clocking. See "Connect the External Clock Using a Wire-Wrap Adapter" section on page B-7.

A cable adaptor with an RJ-45 connector on one end and a BNC coax connector at the other end can be used for clocking.

The maximum cable length is 533 feet (162.46 m) between the MGX switch and the first repeater or channel service unit (CSU). Selection of cable length equalizers is used. Wire build-out is required.

T1/E1 Clock Input Cable Information

The T1 RJ-48 clock port can accept either a T1 or an E1 Building Integrated Timing Supply/Synchronous Equipment Timing Source (BITS/SETS) clock input signal. The E1 RJ-45 clock port can accept twisted pair or 75-ohm coaxial cable. See Table B-5 for cable and signal information for the external clock.

Table B-5 Cable and Signal Information for the External Clock Ports on the PXM-UI-S3 or PXM-UI-S3B Card

Carrier	Cable Media	Signal Type (Data or Sync)
T1	22 AWG, twisted pair with shield. **100**-ohm	Data
E1	22 AWG, twisted pair with shield. **120**-ohm, bipolar or 75-ohm coaxial cable	Data

Building Integrated Timing Supply (BITS) Clock Connector Pin Assignments

For MGX 8850 (PXM1E/PXM45), MGX 8850/B, MGX 8950 switches, and the MGX 8880 Media Gateway, the RJ-48 BITS clock connector has a 100-ohm termination for T1 and a 120-ohm termination for E1.

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Note Make sure that the 100-ohm termination is selected when you configure the clocks for T1. You need to connect only the RX Ring, the RX Tip, and the Ground (pins 4, 5, and 6).

Table B-6 shows the pin assignment for the RJ-48 BITS clock connector.

Table B-6 Pin Assignments for the RJ-48 BITS Clock Connector

Pin No.	Signal
1	TX ring
2	TX tip
3	Ground
4	RX ring
5	RX tip
6	Ground[1]
7	TTP ring
8	TTP tip

1. No connection on the MGX 8830 and MGX 8830/B

Connect the External Clock

The section provides the following installation procedures for connecting the external clock:

- "Connect the External Clock Using an RJ-45 Connection" section on page B-7
- "Connect the External Clock Using a Wire-Wrap Adapter" section on page B-7

Connect the External Clock Using an RJ-45 Connection

Complete the following steps to connect the external clock.

Tip We recommend that you label each data cable at both ends to identify its source and destination.

Step 1 Verify that you have a PXM-UI-S3 or PXM-UI-S3/B back card installed in slots 7 and 8 in the upper rear bay of the switch. (In an MGX 8830 and MGX 8830/B, these cards would be in slots 1 and 2.)

Step 2 Connect the cable connector to the EXT CLK 1 port on the user interface back card.

Step 3 Connect the other end of the cable to the clock source.

Step 4 Repeat Step 1 through Step 3 as necessary for each external clock connection.

Connect the External Clock Using a Wire-Wrap Adapter

The optional RJ-45 to wire-wrap adapter (PXM-WIREWRAP=) connects an external building integrated timing supply (BITS) clock source to the PXM-UI-S3 or PXM-UI-S3/B using s wire-wrap connection instead of an RJ-45 connection (see Figure B-2).

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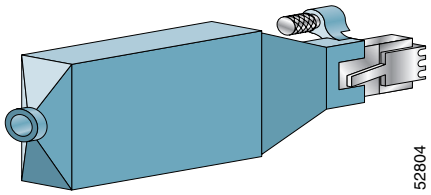
Figure B-2 Optional RJ-45 to Wire-wrap



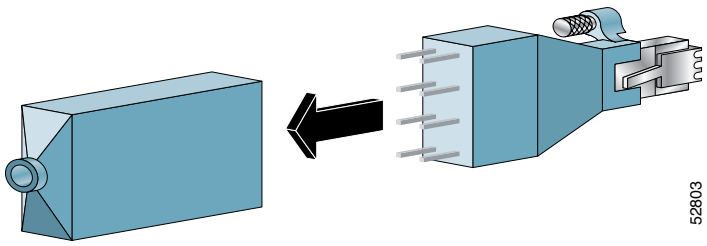
Note The eight pins of the adapter are marked and have a one-to-one correlation to the eight lines on the RJ-45 connector.

When you install the RJ-45 to wire-wrap adapter, you do not need to remove the card from its slot or turn off the power. However, you should wire-wrap the cable conductors to the applicable pins on the adapter before you plug the adapter into the card.

Complete the following steps to connect the external clock using the wire-wrap adapter:

Step 1 Remove the pin cover from the adapter (see Figure B-3). The pin cover provides ESD shielding.

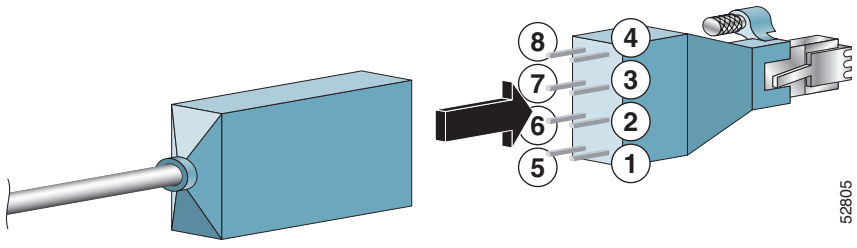
Figure B-3 Removing the Pin Cover from the Adapter



Step 2 Insert the shielded clock source cable through the hole of the pin cover. See Figure B-4.

Note You must use a shielded clock source cable to ensure EMI containment.

Figure B-4 Inserting the Cable through the Pin Cover



Note The length of the exposed (unshielded) wires should be 2 to 4 inches. The maximum allowable length is 4 inches.

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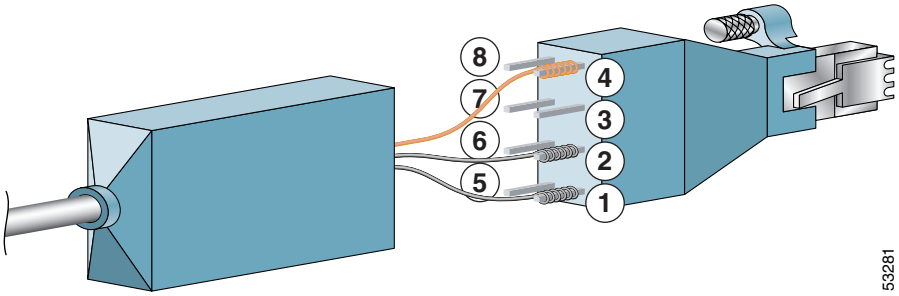
Step 3 Use a wire-wrapping tool to wrap the shield drain wire to the ground pin (pin 3 or 6) of the adapter. The shield drain wire is the bare wire shown in Figure B-5.

Figure B-5 Wires Wire-Wrapped to Pins



Step 4 Use a wire-wrapping tool to wrap the two remaining wires to the pin of the adapter.

Step 5 Slide the pin cover over the pins and onto the body of the adapter after all of the wires are connected.

Step 6 Insert the RJ-45 connector of the adapter into the EXT CLK1 or EXT CLK2 port on the PXM-UI-S3 or PXM-UI-S3/B.

Step 7 If the faceplate of the PXM-UI-S3 or PXM-UI-S3/B has a mating tapped hole, hand tighten the strain-relief screw to provide additional strain relief.

Step 8 Connect the opposite end of the shielded cable to the external BITS clock source.

External Alarm Cabling

The network alarm cable connects to the *ALARM* connector on the PXM-UI-S3 or PXM-UI-S3/B user interface card.

Alarm Cable Information

This section describes cables, connectors, and pin assignments for network alarm cabling.

Alarm Cable Information for MGX Switches

Table B-7 describes the Alarm cable used for the MGX 8850 (PXM1E/PXM45), MGX 8850/B, MGX 8950, MGX 8830 and MGX 8830/B switches.

Table B-7 External Alarm Cable and Connector Information for MGX Switches

Cable Parameter	Description
Interface	Dry-contact relay closure
Wire	24 AWG, shielded, 6-pair
Connector	DB-15, subminiature, male

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Alarm Connector Pin Assignments

Table B-8 describes the Alarm connector pin assignments for the different MGX multiservice switches.

Table B-8 Pin Assignments for the DB-15 ALARM Connector

MGX 8850 (PXM1/PXM45), MGX 8850/B, MGX 8950 Only			MGX 8830, MGX 8830/B Only		
Pin #	**Alarm**	**Description**	**Pin #**	**Alarm**	**Description**
1	Audible—critical	Normally on	1	Audible—Major	Normally open
2	Visual—critical	Normally on	2		Common
3	Visual—critical	Normally off	3	Audible—Minor	Normally open
4	Audible—major	Common	4	Visual—Major	Normally open
5	Visual—major	Common	5		Common
6	Audible—minor	Normally on	6	Visual—Minor	Normally open
7	Visual—minor	Normally on	7	unused	n.c.
8	Visual—minor	Normally off	8	unused	n.c.
9	Visual—critical	Normally off	9		Normally closed
10	Visual—critical	Common	10		Normally closed
11	Audible—major	Normally on	11		Common
12	Visual—minor	Normally on	12		Normally closed
13	Visual—major	Normally off	13		Normally closed
14	Audible—minor	Common	14		Common
15	Visual—minor	Common	15	unused	n.c.

Connector Pin Functions for Audio and Visual Alarms

Table B-9 shows the pin numbers and functions on the ALARM connector on the PXM-UI-S3 and PXM-UI-S3/B user interface back card.

- When Audio Alarm is enabled, the Audio Alarm On and Audio Alarm Common pins are closed (short circuit).
- When Audio Alarm is disabled, the Audio Alarm On and Audio Alarm Common pins are opened (open circuit).
- When Visual Alarm is enabled, the Visual Alarm On and Visual Alarm Common pins are closed, and the Visual Alarm Off pin is opened.
- When Visual Alarm is disabled, the Visual Alarm Off and Visual Alarm Common pins are closed, and the Visual Alarm On pin is opened.

Table B-9 PXM-UI-S3 Pin Assignment on the ALARM Connector

Pin Name	Pin No.	Audio Enable	Audio Disable	Visual Enable	Visual Disable
Critical Audio Alarm On	1	S[1]	O[2]	—	—
Critical Audio Alarm Common	9	Common	Common	—	—

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Table B-9 PXM-UI-S3 Pin Assignment on the ALARM Connector (continued)

Pin Name	Pin No.	Audio Enable	Audio Disable	Visual Enable	Visual Disable
Critical Visual Alarm On	2	—	—	S	O
Critical Visual Alarm Common	10	—	—	Common	Common
Critical Visual Alarm Off	3	—	—	O	S
Major Audio Alarm On	11	S	O	—	—
Major Audio Alarm Common	4	Common	Common	—	—
Major Visual Alarm On	12	—	—	S	O
Major Visual Alarm Common	5	—	—	Common	Common
Major Visual Alarm Off	13	—	—	O	S
Minor Audio Alarm On	6	S	O	—	—
Minor Audio Alarm Common	14	Common	Common	—	—
Minor Visual Alarm On	7	—	—	S	O
Minor Visual Alarm Common	15	—	—	Common	Common
Minor Visual Alarm Off	8	—	—	O	S

1. S = Signal is shorted with Common
2. O = Signal is opened

Pin States for Each Alarm State

Table B-10 summarizes which pins are open (open circuit) and which pins are closed (short circuit) for each alarm state.

Table B-10 Pin States for Each Audio and Visual Alarm State

Alarm	Alarm State	Pin	Pin State
Audio alarm	Enabled	Audio Alarm On	Closed
		Audio Alarm Common	Closed
	Disabled	Audio Alarm On	Open
		Audio Alarm Common	Open
Visual alarm	Enabled	Visual Alarm On	Closed
		Visual Alarm Common	Closed
		Visual Alarm Off	Open
	Disabled	Visual Alarm On	Open
		Visual Alarm Common	Closed
		Visual Alarm Off	Closed

Power Cabling

This section provides information on providing AC and DC power cabling for the MGX switch.

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AC Power Cabling—MGX 8850 (PXM1E/PXM45), MGX 8850/B and MGX 8880

We provide a 6-foot (1.8-meter) AC power cord for an AC-powered system. This AC power cord is available for the following countries:

- Argentina: Cisco Part Number CAB-ACR
- Australia: Cisco Part Number PWRCD-ANZ
- Continental Europe: Cisco Part Number PWRCD-EU
- Great Britain: Cisco Part Number PWRCD-GBI
- Ireland: Cisco Part Number PWRCD-GBI
- Italy: Cisco Part Number PWRCD-IT
- Japan: Cisco Part Number PWRCD-NA
- New Zealand: Cisco Part Number PWRCD-ANZ
- North America: Cisco Part Number PWRCD-NA (NEMA L6-20 twistlock plug)

For the number of power cords that support your MGX 8850 (PXM1E/PXM45), MGX 8850/B and MGX 8880 switches, see Table 1-5.

AC Power Cabling—MGX 8950

We provide a 10-foot (3 meter) AC power cord for an AC-powered system. This AC power cord is available for the following countries:

- Europe: Cisco Part Number PWRCD-30A-EU
- North America: Cisco Part Number PWRCD-30A-NA

Table B-11 shows the power cords requirements for the MGX 8950 switch.

Table B-11 AC Power Cable and Plug Requirements—MGX 8950

Cable Parameter	Description
Cable	Provided with 10 feet (2.3 m) of 3-conductor wire with plug.
Plug (customer end)	30A NEMA L6-30, 3-prong plug (United States) For international use, the line cord is hard-wired with an IEC309 plug.

For the number of power cords that support your MGX 8950 switch, see Table 3-14.

AC Power Cabling—MGX 8830 and MGX 8830/B

Either Cisco or the customer can provide the AC power cord. See Table B-12 for the power cords that Cisco can supply. In addition, you can special-order AC cables with other plugs or different lengths. If you want to construct the power cord, it must mate with an IEC320 (C-14) 10/15A male receptacle on the back of the AC power module.

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Table B-12 AC Power Cable and Plug Requirements—MGX 8830 and MGX 8830/B

Cable Parameter	Description
Cable	Provided with 8 feet (2.3 meters) of 3-conductor wire with plug.
Plug (customer end)	• 20A NEMA L6-20P, twist lock plug (United States) • NEMA5-15P 125V/15 A 3-prong plug, grounding type (North America) • 15A NEMA 5-15 (domestic U.S. and Canada) • 13 A 250 Vac BS1363, 3-prong fused plug (UK and Ireland) • CEE 7/7 (Continental Europe) • AS3112 (Australia and New Zealand) • CEI23-16/VII (Italy) • 125V/15A (North America)

DC Power Cabling

Table B-13 lists DC power cable and connector recommendations for each MGX switch and media gateway system. Typically, Cisco does not provide power cabling for DC-powered systems.

Table B-13 DC Power Cabling Recommendations

Switch Name	DC Cable Wiring	DC Cable Connection
MGX 8850 (PXM1E/PXM45) and MGX 8850/B	Three conductor, 6 AWG (10 square mm) or larger, solid or stranded copper wire with insulation rating for 140°F (60°C) minimum with wire insulation stripped back 0.25 in (6.35 mm) at the chassis connector end.	Panduit terminal lug (part number LC AS6-10-L) or equivalent to fit no. 10-32 screws.
MGX 8950	Three conductor, 6 AWG (10 square mm) recommended wire gauge, min. 60 degrees Celsius insulation rating, copper conductors only. Panduit LC AS6-10-L terminal lug or equivalent to fit no. 10-32 screws.	Panduit terminal lug (part number LC AS6-10-L) or equivalent to fit no. 10-32 screws.
MGX 8830 and MGX 8830/B	Three conductor, 10 AWG recommended wire gauge, solid or stranded copper wire with insulation rating for 140°F (60°C) minimum with wire insulation stripped back 0.25 in (6.35 mm) at the chassis connector end.	EURO Block.
MGX 8880 Media Gateway	Three conductor, 6 AWG (10 square mm) or larger, solid or stranded copper wire with insulation rating for 140°F (60°C) minimum with wire insulation stripped back 0.25 in (6.35 mm) at the chassis connector end.	Panduit terminal lug (part number LC AS6-10-L) or equivalent to fit no. 10-32 screws.

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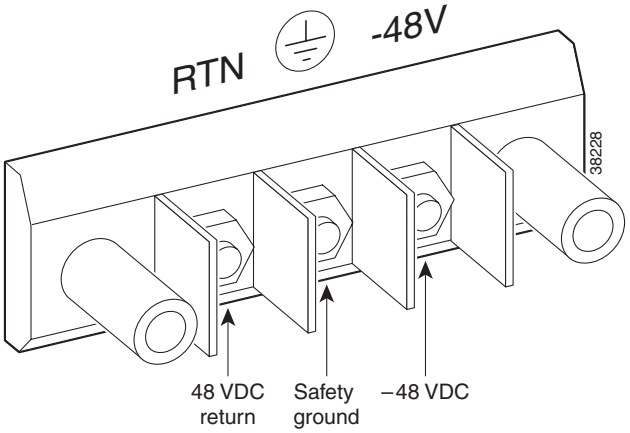
DC Power Connections

For the MGX 8850 (PXM1E/PXM45), MGX 8850/B, MGX 8950, and MGX 8880 systems, DC power connections are made to the terminal block on the back of the DC power entry modules (PEMs), as shown in Figure B-6. The DC PEMs are installed on the back of the air intake plenum.

For MGX 8830 or MGX 8830/B systems, DC power connections are made to the DC power entry modules (PEMs) at the rear of the switch.

See Table B-13 for details on DC power cabling and connections.

Figure B-6 DC Power Connections on DC PEM Terminal Block—MGX 8850 (PXM1E/PXM45), MGX 8850/B, MGX 8950, and MGX 8880



Redundancy Y-Cable

Y-cables provide card redundancy. This section contains Y cable Cisco product numbers by switch.

Y Cables for MGX 8850 (PXM1E/PXM45), MGX 8850/B and MGX 8880

Table B-14 lists the Y-cables used with various MGX 8850 (PXM1E/PXM45), MGX 8850/B, and MGX 8880 cards.

Table B-14 Y-Cable Product Numbers for MGX 8850 (PXM1E /PXM45), MGX 8850/B, and MGX 8880 Cards

Back Card	Connector Hardware	Type/Standard Interface	Y Cable Cisco Product Number	MGX 8850 (PXM1E/PXM45), MGX 8850/B, and MGX 8880	MGX 8950
PXM-UI-S3/B	RJ-45		CAB-SSIO-RJ45	x	
PXM-UI-S3 PXM-UI-S3/B	RJ-45	EIA/TIA-232	CAB-5686-04	x	x
PXM-UI-S3 PXM-UI-S3/B	RJ-45	T1 BITS clock	CAB-5686-04	x	

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Table B-14 Y-Cable Product Numbers for MGX 8850 (PXM1E /PXM45), MGX 8850/B, and MGX 8880 Cards (continued)

Back Card	Connector Hardware	Type/Standard Interface	Y Cable Cisco Product Number	MGX 8850 (PXM1E/PXM45), MGX 8850/B, and MGX 8880	MGX 8950
PXM-UI-S3 PXM-UI-S3/B	RJ-45	E1 BITS clock	CAB-5686-04	x	
PXM-UI-S3 PXM-UI-S3/B	RJ-45	E1 BITS clock	CAB-5686-04	x	
PXM-UI-S3 PXM-UI-S3/B	DB-15	Alarm output	CAB-5607-10 (10-in. Y)	x	x
PXM-HD	SC	MMF	CAB-MMF-Y-SC	x	x
BNC-3T3-M	BNC	75 ohm, coaxial	CAB-BNC-Y/B	x	
AXSM	LC	SMF	CAB-MMF-LC CAB-MMF-LC-Y	x	x
AXSM	MTRJ	MMF	CAB-MTRJ-SC-MM-3M CAB-MTRJ-SC-MM-5M	x	x
AXSM	SC	SMF	CAB-SMF-Y-SC CAB-SMF-SC (several)	x	x
AXSM PXM1E	MCC	Miniature coaxial cable, E1	CAB-MCC-BNC CAB-MCC-BNC-Y	x	
AXSM PXM1E	RBBN	T1/E1	CAB-RBBN-16-T1E1-Y CAB-RBBN-16-T1E1[1]	x	
PXM-UI-S3	RJ45	EIA/TIA-232	CAB-5684-04		
PXM-UI-S3	RJ45	EIA/TIA-232	CAB-5684-04		
PXM-UI-S3	RJ45	T1 BITS Clock	CAB-5686-04		
PXM-HD	SC	SMF	CAB-SMF-Y-SC		

1. Two cables required per back card, one TX and one RX.

Y Cables for MGX 8950

Table B-15 lists the Y-cables used with various Cisco MGX 8950 cards.

Table B-15 Y-Cable Product Numbers for MGX 8950 Cards

MGX 8950 Card	Connector Hardware	Type/Standard Interface	Y Cable Product Number
PXM-UI-S3	RJ45	EIA/TIA-232	CAB-5684-04 (6-inch Y)
PXM-UI-S3	RJ45	EIA/TIA-232	CAB-5684-04
PXM-UI-S3	RJ45	T1 BITS Clock	CAB-5686-04 (6-inch Y)
PXM-UI-S3	DB15	Alarm Output	CAB-5607-10 (10-inch Y)

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Table B-15 Y-Cable Product Numbers for MGX 8950 Cards (continued)

MGX 8950 Card	Connector Hardware	Type/Standard Interface	Y Cable Product Number
AXSM	LC	SMF	
AXSM	MTRJ	MMF	
AXSM	SC	MMF	CAB-MMF-Y-SC

Trunk Cabling

This section provides information about T3 and E3 trunk cabling.

T3 Trunk Cabling

A trunk cable connects each T3 port on the SMB-8T3 back card to a T3 port on the colocated MGX 8220 node. See Table B-16 for information about the T3 trunk cable wiring and connector.

Table B-16 T3 Trunk Cable and Connector Information

Cable Parameter	Description
Type	75-ohm coaxial cable (RG-59 B/U for short runs; AT&T 734A for longer runs). Two per T3 line (transmit and receive).
Maximum length	450 feet between the Cisco MGX 8850 or MGX 8950 switch and the DSX-3. 450 feet between the Cisco MGX 8830 switch and the other equipment.
Connector	Terminated in male SMB. Rx is received from trunk; Tx is transmitted to trunk.

See Table B-17 for details on SMB pin functions.

Table B-17 T3 Connector Pin Functions

Connector	Description
Rx SMB	Receive T3 from trunk
Tx SMB	Transmit T3 to trunk

E3 Trunk Cabling

A trunk cable connects each E3 port on the SMB-8E3 back card to an E3 port on the colocated MGX 8220 node. See Table B-18 for information about the E3 trunk cable wiring and connector.

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Table B-18 E3 Trunk Cable and Connector Information

Cable Parameter	Description
Type	75-ohm coaxial cable (RG-59 B/U for short runs, AT&T 734A for longer runs). Two per E3 line (transmit and receive).
Maximum length	100 feet between the Cisco MGX 8850 switch and the CS/DSU. 450 feet maximum between the Cisco MGX 8950 switch and the DSX-3.
Connector	Terminated in male SMB. Rx is received from trunk; Tx is transmitted to trunk.

See Table B-19 for details on SMB pin functions.

Table B-19 E3 Connector Pin Functions

Connector	Description
Rx SMB	Receive E3 from trunk
Tx SMB	Transmit E3 to trunk

Frame Relay Cabling

This section describes the cabling and connector pin assignments for the Frame Relay cards.

Note The Frame Relay Cabling section does not apply to the MGX 8950 switch or MGX 8880 gateway.

T1 Cabling

T1 trunk cables connect the customer DSX-1 cross-connect point or T1 channel service unit (CSU) to the Cisco MGX 8850 or MGX 8830 switch at the T1 back card.

See Table B-20 for T1 trunk cable and connector information.

Table B-20 T1 Trunk/Circuit Line Cable and Connector Specifications

Cable Parameter	Description
Cable type	Western Electric 22 AWG, ABAM individually shielded twisted pair (100 ohm balanced). Two pair per T1 line (one transmit and one receive).
Cable connector	RJ-48C male. (Figure B-7 illustrates the RJ-48 connector schematic.)
Maximum cable length	655 feet (199.64 meters) maximum between the Cisco MGX 8850 or MGX 8830 switch and the first repeater or CSU. A selection of cable length equalizers is available.

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See Table B-21 for pin assignments for the RJ-48C T1 and E1 connector.

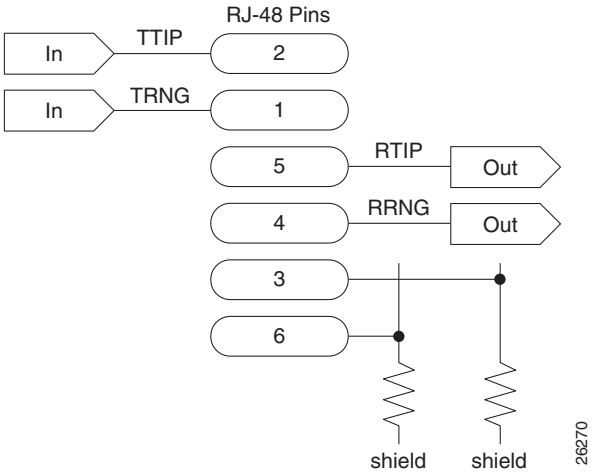
Table B-21 RJ-48C T1 and E1 Connector Pin Assignments

Pin No.	Description
1	Transmit Ring
2	Transmit Tip
3	Transmit Shield
4	Receive Tip
5	Receive Ring
6	Receive Shield

Note Transmit direction is toward the T1 trunk.

See Figure B-7 for an RJ-48 connector schematic.

Figure B-7 RJ-48 Connector Schematic



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E1 Cabling

E1 trunk cables connect the customer DSX-1 cross-connect point or E1 CSU to the MGX switch at the FRSM E1 back card (SMB-8E1).

See Table B-22 for E1 trunk cable and connector information.

Table B-22 E1 Trunk/Circuit Line Cable and Connector Specification

Cable Parameter	Description
Cable type (BNC-8E1)	75-ohm coax cable for unbalanced connection. Two cables or pairs (one transmit and one receive) per E1 line.
Cable connector	16 female SMB for unbalanced connection.
Maximum cable length	Approximately 100 meters (328 feet) maximum between the Cisco MGX 8850 or Cisco MGX 8830 switch and the first repeater or CSU. A selection of cable length equalizers is available.

See Table B-21 for pin assignments for the RJ-48C T1 and E1 connector.

See Table B-23 for pin assignments for the RJ-48C E1 connector—unbalanced.

Table B-23 RJ-48C E1 Connector Pin Assignments—Unbalanced

Connector	Description
Rx BNC	Receive E1 from trunk
Tx BNC	Transmit E1 to trunk

MGX-12IN1-S8 Back Card Cables

The back card for the MGX-FRSM-HS2/B is the MGX-12IN1-S8. Each port on the back card connects through a DTE version or DCE version of the Cisco 12IN1 cable. The signal on the back card depends on whether the back card connector is DTE or DCE and whether the back card has been set as X.21 or V.35 as shown in Table B-24.

For the signals on the back card, see Table B-25 and Table B-26. The tables show the signal acronym, signal name, and signal source.

Table B-24 12IN1-S8 and 12IN1-S4 Back Card Cable Types

Cable Type	X.21	V.35
DCE	X.21 DCE	V.35 DCE
DTE	X.21 DTE	V.35 DTE

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Table B-25 V.35 Signals

Acronym	Signal Name	Signal Source
RTS	Request to Send	DTE
DTR	Data Terminal Ready	DTE
CTS	Clear To Send	DCE
DSR	Data Set Ready	DCE
DCD	Data Carrier Detect	DCE
GND	Ground	both
B_LL	Local Loopback	DTE
GND	Ground	both
TxD+	Transmit Data	DTE
TxD–	Transmit Data	DTE
RxD+	Receive Data	DCE
RxD–	Receive Data	DCE
TXCE	Secondary Clear to Send	DTE
TXCE	Secondary Clear to Send	DTE
RxC+	Receive Clock	DCE
RxC–	Receive Clock	DCE
TxC+	Transmit Clock	DCE
TxC–	Transmit Clock	DCE

Table B-26 X.21 Signals

Signal	Name
Mode_2	Local connections
Mode_DCE	Local connections
Ground	Shield Ground
O_TXD/RSC+	Transmit +
OTXD/RXD-	Transmit -
O_RTS/CTS+	Control +
O_RTS/CTS-	Control -
I_RDX/TXD+	Receive +
I_RXD/TXD-	Receive -
ICTS/RTS+	Indication +
I_CTS/RTS-	Indication -
I_RXC/TXCE+	Timing +

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Table B-26 X.21 Signals (continued)

Signal	Name
I_RXC/TXCE-	Timing -
GND	CCT Ground

Each cable can have a male or female connector at the far end. Also, the available clock sources depend on the mode:

- In DTE mode, the clock source is either *line* or *ST* (ST is a wire in the cable).
- In DCE mode, the clock source is the front card.

See Table B-27 for the relationship between cabling and modes.

For part numbers of the standard and non-standard 12IN1 cables, see Table B-28.

Note The cable type and part number are printed on a plastic band located near the smaller connector.

Table B-27 Cabling and Clock Sources for the MGX-FRSM-HS2/B

Mode	Type of Cable	Clock Source	Mode of Far End
DTE	DTE	Line	DCE (male or female connector at far end)
DCE	DCE	Internal (front card)	DTE (male or female connector at far end)
DTE_ST	DTE	ST line	DCE (male or female connector at far end)

Table B-28 Cabling Types and Part Numbers for X.21 and V.35 Protocols for MGX-FRSM-xxxx Cards

Type of Cable	Far End Connector	Part Number
X.21 DTE	Male (standard)	72-1440-01
X.21 DCE	Female (standard)	72-1427-01
V.35 DTE	Male (standard)	72-1428-01
V.35 DTE	Female (non-standard)	72-1436-01
V.35 DCE	Female (standard)	72-1429-01
V.35 DCE	Male (non-standard)	72-1437-01
V.35 DTE-DCE	—	72-1441-01
Straight-through	—	72-1478-01
Loopback plug	—	72-1479-01

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MGX-SCSI2-2HSSI/B Port Connectors

The High-Speed Serial Interface (HSSI) port connects through a female SCSI-II connector This connector complies with specifications in ANSI/TIA/EIA-613. See Table B-29 for the SCSI-II connector pin assignments.

Table B-29 Pin Assignments for the SCSI-II Connector

Pin No.	Name	Signal Function	Polarity	Signal Source
11	SD	Send Data	Positive	DTE
36			Negative	
4	RD	Receive Data	Positive	DCE
29			Negative	
6	ST	Send Timing	Positive	
31			Negative	
2	RT	Receive Timing	Positive	
27			Negative	
6	TT	Terminal Timing	Positive	DCE
13			Negative	
3	CA	DCE Available	Positive	DCE
28			Negative	
8	TA	DTE Available	Positive	DTE
33			Negative	
10	LA	Loop Ckt A	Positive	DTE
35			Negative	
12	LB	Loop Ckt B	Positive	DTE
37			Negative	
5	LC	Loop Ckt C	Positive	DCE
30			Negative	
	SG	Signal Ground		

VXSM-24-T1-E1-BC Connectors

There are two 50 pin AMP connectors on VXSM-24-T1-E1 back cards. One is used for the 24 transmit pair (Tip/Ring) and the other is used for the 24 receive pair (Tip/Ring). Each connector connects to the patch panel independently through a cable assembly.

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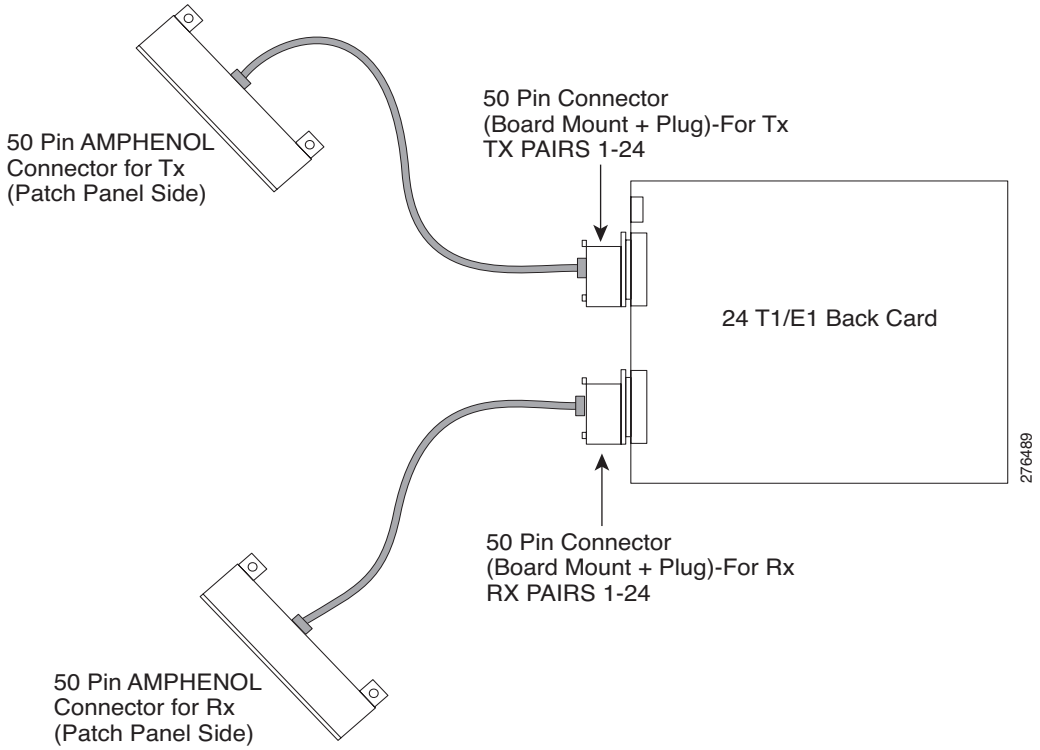
Figure B-8 24 T1/E1 Back Card Cable Diagram



The signal description for 50 pin champ connector for transmit interface is shown in Table B-30.

Table B-30 Tx 50 Pin Connector Signals

Pin	Signal name	Signal name	Pin
1	TXRING1	TXTIP1	26
2	TXRING2	TXTIP2	27
3	TXRING3	TXTIP3	28
4	TXRING4	TXTIP4	29
5	TXRING5	TXTIP5	30
6	TXRING6	TXTIP6	31
7	TXRING7	TXTIP7	32
8	TXRING8	TXTIP8	33
9	TXRING9	TXTIP9	34
10	TXRING10	TXTIP10	35
11	TXRING11	TXTIP11	36
12	TXRING12	TXTIP12	37
13	TXRING13	TXTIP13	38
14	TXRING14	TXTIP14	39
15	TXRING15	TXTIP15	40
16	TXRING16	TXTIP16	41

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Table B-30 Tx 50 Pin Connector Signals

Pin	Signal name	Signal name	Pin
17	TXRING17	TXTIP17	42
18	TXRING18	TXTIP18	43
19	TXRING19	TXTIP19	44
20	TXRING20	TXTIP20	45
21	TXRING21	TXTIP21	46
22	TXRING22	TXTIP22	47
23	TXRING23	TXTIP23	48
24	TXRING24	TXTIP24	49
25			50

The signal description for 50 pin champ connector for receive interface is shown in Table B-31

Table B-31 Rx 50 Pin Connector Signals

Pin	Signal name	Signal name	Pin
1	RXRING1	TXTIP1	26
2	RXRING2	TXTIP2	27
3	RXRING3	TXTIP3	28
4	RXRING4	TXTIP4	29
5	RXRING5	TXTIP5	30
6	RXRING6	RXTIP6	31
7	RXRING7	RXTIP7	32
8	RXRING8	RXTIP8	33
9	RXRING9	RXTIP9	34
10	RXRING10	RXTIP10	35
11	RXRING11	RXTIP11	36
12	RXRING12	RXTIP12	37
13	RXRING13	RXTIP13	38
14	RXRING14	RXTIP14	39
15	RXRING15	RXTIP15	40
16	RXRING16	RXTIP16	41
17	RXRING17	RXTIP17	42
18	RXRING18	RXTIP18	43
19	RXRING19	RXTIP19	44
20	RXRING20	RXTIP20	45
21	RXRING21	RXTIP21	46
22	RXRING22	RXTIP22	47

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Table B-31 Rx 50 Pin Connector Signals

Pin	Signal name	Signal name	Pin
23	RXRING23	RXTIP23	48
24	RXRING24	RXTIP24	49
25			50

Illustrated Cable Guide

This section shows which cables are used for Cisco MGX 8850 (PXM1E/PXM45), MGX 8850/B, MGX 8950, MGX 8830, MGX 8830/B and MGX 8880 chassis and cards. Cables in this section are listed alphabetically.

List of Cables by Front and Back Card Type

Table B-32 lists cables by front and back card types. The table includes Y-cables, 1:1 cables, adaptor cables, and special cables.

Table B-32 List of Cables by Front and Back Card Types

Front Card Type	Back Card Types	APS or SFP Optics	Cable Description	Y-Cables	1:1 Cables	Adaptor Cables
PXM1E-8-155	PXM-UI-S3/B		DB15(M) to DB15(F) Y cable 10' RJ48(M) to RJ48(F) Y cable 4" RJ48(M) to RJ48(F) Y cable 6" SS(M) to 3xRJ48(F) Y cable 6" Balun for 120ohm to 75ohm conversion	CAB-5607-10 CAB-5686-04 CAB-5686-06		CAB-SSIO=RJ45
	MCC-8-155	MGX-APS-CON MGX-8850-APS-CON	MCC(M) to BNC(F) simplex MCC(M) to BNC(F) Y-cable simplex	CAB-MCC-BNC-Y		CAB-MCC-BNC
	SFP-8-155	MGX-APS-CON MGX-8850-APS-CON SMFIR-1-155-SFP SMFLR-1-155-SFP MMF-1-155-SFP	SMFIR LC to LC cable simplex 10' SMFIR LC to LC Y cable simplex 6' SMFLR LC to LC cable simplex 10' SMFLR LC to LC Y cable simplex 6' MMF LC to LC cable simplex 10' MMF LC to LC Y cable simplex 6'	CAB-SMFIR-LC-Y CAB-SMFLR-LC-Y CAB-MMF-LC-Y	CAB-SMFIR-LC CAB-SMFLR-LC CAB-MMF-LC	

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Table B-32 List of Cables by Front and Back Card Types (continued)

Front Card Type	Back Card Types	APS or SFP Optics	Cable Description	Y-Cables	1:1 Cables	Adaptor Cables
PXM1E-4-155	PXM-UI-S3/B		DB15(M) to DB15(F) Y cable 10' RJ48(M) to RJ48(F) Y cable 4" RJ48(M) to RJ48(F) Y cable 6" SS(M) to 3xRJ48(F) Y cable 6" Balun for 120ohm to 75ohm conversion	CAB-5607-10 CAB-5686-04 CAB-5686-06		CAB-SSIO=RJ45
	MMF-4-155/C	APS recommended				
	SMFIR-4-155/C	APS recommended				
	SMFLR-4-155/C	APS recommended				
PXM1E-8-T3E3	PXM-UI-S3/B		DB15(M) to DB15(F) Y cable 10' RJ48(M) to RJ48(F) Y cable 4" RJ48(M) to RJ48(F) Y cable 6" SS(M) to 3xRJ48(F) Y cable 6" Balun for 120ohm to 75ohm conversion	CAB-5607-10 CAB-5686-04 CAB-5686-06		CAB-SSIO=RJ45
	SMB-8-T3		SMB(M) to BNC(F) Y cable simplex 6" SMB(M) to BNC(F) simplex 6" SMB(M) to SMB(M) simplex 6' SMB(M) to BNC(F) simplex 6" Bundle of 6x CAB-T3E3-PL-AD Bundle of 12x CAB-T3E3-PL-AD Bundle of 16x CAB-T3E3-PL-AD Bundle of 24x CAB-T3E3-PL-AD SMB(M) to BNC(F) Y cable simplex 6" Bundle of 6x CAB-T3E3-PL-Y Bundle of 12x CAB-T3E3-PL-Y Bundle of 16x CAB-T3E3-PL-Y Bundle of 24x CAB-T3E3-PL-Y SMB(M) to BNC(F) simplex 6" CE Europe SMB(M) to BNC(F) Y cable simplex 6" CE Europe	CAB-5681-06 CAB-SMB-BNC-Y CAB-T3E3-PL-Y-6 CAB-T3E3-PL-Y-12 CAB-T3E3-PL-Y-16 CAB-T3E3-PL-Y-24 CAB-T3E3-PL-CE-Y	CAB-5698-6	CAB-5682-06 CAB-T3E3-PL-AD CAB-T3E3-PL-AD-6 CAB-T3E3-PL-AD-12 CAB-T3E3-PL-AD-16 CAB-T3E3-PL-AD-24 CAB-T3E3-PL-CE-AD
	SMB-8-E3		SMB(M) to BNC(F) Y cable simplex 6" SMB(M) to BNC(F) simplex 6" SMB(M) to SMB(M) simplex 6' SMB(M) to BNC(F) simplex 6" Bundle of 6x CAB-T3E3-PL-AD Bundle of 12x CAB-T3E3-PL-AD Bundle of 16x CAB-T3E3-PL-AD Bundle of 24x CAB-T3E3-PL-AD SMB(M) to BNC(F) Y cable simplex 6" Bundle of 6x CAB-T3E3-PL-Y Bundle of 12x CAB-T3E3-PL-Y Bundle of 16x CAB-T3E3-PL-Y Bundle of 24x CAB-T3E3-PL-Y SMB(M) to BNC(F) simplex 6" CE Europe SMB(M) to BNC(F) Y cable simplex 6" CE Europe	CAB-5681-06 CAB-SMB-BNC-Y CAB-T3E3-PL-Y-6 CAB-T3E3-PL-Y-12 CAB-T3E3-PL-Y-16 CAB-T3E3-PL-Y-24 CAB-T3E3-PL-CE-Y	CAB-5698-6	CAB-5682-06 CAB-T3E3-PL-AD CAB-T3E3-PL-AD-6 CAB-T3E3-PL-AD-12 CAB-T3E3-PL-AD-16 CAB-T3E3-PL-AD-24 CAB-T3E3-PL-CE-AD

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Table B-32 List of Cables by Front and Back Card Types (continued)

Front Card Type	Back Card Types	APS or SFP Optics	Cable Description	Y-Cables	1:1 Cables	Adaptor Cables
PXM1E-T3E3-155	PXM-UI-S3/B		DB15(M) to DB15(F) Y cable 10' RJ48(M) to RJ48(F) Y cable 4" RJ48(M) to RJ48(F) Y cable 6" SS(M) to 3xRJ48(F) Y cable 6" Balun for 120ohm to 75ohm conversion	CAB-5607-10 CAB-5686-04 CAB-5686-06		CAB-SSIO=RJ45
	MGX-T3E3-155 (OC3/STM1 ports)	APS not required SMFIR-1-155-SFP SMFLR-1-155-SFP MMF-1-155-SFP	SMFIR LC to LC cable simplex SMFIR LC to LC Y cable simplex SMFLR LC to LC cable simplex SMFLR LC to LC Y cable simplex MMF LC to LC cable simplex MMF LC to LC Y cable simplex	CAB-SMFIR-LC-Y CAB-SMFLR-LC-Y CAB-MMF-LC-Y	CAB-SMFIR-LC CAB-SMFLR-LC CAB-MMF-LC	
	(T3E3 ports)		MCC(M) to BNC(F) simplex MCC(M) to BNC(F) Y-cable simplex	CAB-MCC-BNC-Y		CAB-MCC-BNC
PXM1E-16-T1E1	PXM-UI-S3/B		DB15(M) to DB15(F) Y cable 10' RJ48(M) to RJ48(F) Y cable 4" RJ48(M) to RJ48(F) Y cable 6" SS(M) to 3xRJ48(F) Y cable 6" Balun for 120ohm to 75ohm conversion	CAB-5607-10 CAB-5686-04 CAB-5686-06		CAB-SSIO=RJ45
	MCC-16-E1		MCC(M) to BNC(F) simplex MCC(M) to BNC(F) Y-cable simplex	CAB-MCC-BNC-Y		CAB-MCC-BNC
	RBBN-16-T1E1		RBBN 36p(M) to RBBN36p(F) Y-cable simplex 2xRBBN 36p(M) to 1xRBBN50p(F)	CAB-RBBN-T1E1-Y [1]		
PXM45	PXM-HD		Connectors on this card are not used.			
	PXM-UI-S3		DB15(M) to DB15(F) Y cable 10' RJ48(M) to RJ48(F) Y cable 4" RJ48(M) to RJ48(F) Y cable 6" Balun for 120ohm to 75ohm conversion	CAB-5607-10 CAB-5686-04 CAB-5686-06		
PXM45/B[2]	PXM-HD		Connectors on this card are not used.			
	PXM-UI-S3		DB15(M) to DB15(F) Y cable 10' RJ48(M) to RJ48(F) Y cable 4" RJ48(M) to RJ48(F) Y cable 6" Balun for 120ohm to 75ohm conversion	CAB-5607-10 CAB-5686-04 CAB-5686-06		
PXM45/C[2]	PXM-HD		Connectors on this card are not used.			
	PXM-UI-S3/B		DB15(M) to DB15(F) Y cable 10' RJ48(M) to RJ48(F) Y cable 4" RJ48(M) to RJ48(F) Y cable 6" SS(M) to 3xRJ48(F) Y cable 6" Balun for 120ohm to 75ohm conversion	CAB-5607-10 CAB-5686-04 CAB-5686-06		CAB-SSIO=RJ45

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Table B-32 List of Cables by Front and Back Card Types (continued)

Front Card Type	Back Card Types	APS or SFP Optics	Cable Description	Y-Cables	1:1 Cables	Adaptor Cables
AXSM-1-2488	SMFSR-1-2488					
	SMFLR-1-2488					
	SMFXLR-1-2488					
AXSM-1-2488/B	SMFSR-1-2488/B	MGX-APS-CON MGX-8850-APS-CON				
	SMFLR-1-2488/B	MGX-APS-CON MGX-8850-APS-CON				
	SMFXLR-1-2488/B	MGX-APS-CON MGX-8850-APS-CON				
AXSM-2-622-E	SMFIR-1-622/C	MGX-APS-CON MGX-8850-APS-CON				
	SMFLR-1-622/C	MGX-APS-CON MGX-8850-APS-CON				
AXSM-4-622	SMFIR-2-622					
	SMFLR-2-622					
AXSM-4-622/B	SMFIR-2-622/B	MGX-APS-CON MGX-8850-APS-CON				
	SMFLR-2-622/B	MGX-APS-CON MGX-8850-APS-CON				
AXSM-8-155-E	SMB-4-155	MGX-APS-CON MGX-8850-APS-CON	SMB(M) to BNC(F) Y cable simplex 6" SMB(M) to BNC(F) simplex 6" SMB(M) to SMB(M) simplex 6' SMB(M) to BNC(F) simplex 6" Bundle of 6x CAB-T3E3-PL-AD Bundle of 12x CAB-T3E3-PL-AD Bundle of 16x CAB-T3E3-PL-AD Bundle of 24x CAB-T3E3-PL-AD SMB(M) to BNC(F) Y cable simplex 6" Bundle of 6x CAB-T3E3-PL-Y Bundle of 12x CAB-T3E3-PL-Y Bundle of 16x CAB-T3E3-PL-Y Bundle of 24x CAB-T3E3-PL-Y SMB(M) to BNC(F) simplex 6" CE Europe SMB(M) to BNC(F) Y cable simplex 6" CE Europe	CAB-5681-06 CAB-SMB-BNC-Y CAB-T3E3-PL-Y-6 CAB-T3E3-PL-Y-12 CAB-T3E3-PL-Y-16 CAB-T3E3-PL-Y-24 CAB-T3E3-PL-CE-Y	CAB-5698-6	CAB-5682-06 CAB-T3E3-PL-AD CAB-T3E3-PL-AD-6 CAB-T3E3-PL-AD-12 CAB-T3E3-PL-AD-16 CAB-T3E3-PL-AD-24 CAB-T3E3-PL-CE-AD
	MMF-4-155/C	MGX-APS-CON MGX-8850-APS-CON	SC to SC MMF Y cable simplex	CAB-MMF-Y-SC		
	SMFIR-4-155/C	MGX-APS-CON MGX-8850-APS-CON	SC to SC SMF Y-cable simplex	CAB-SMF-Y-SC		
	SMFLR-4-155/C	MGX-APS-CON MGX-8850-APS-CON	SC to SC SMF Y-cable simplex	CAB-SMF-Y-SC		

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Table B-32 List of Cables by Front and Back Card Types (continued)

Front Card Type	Back Card Types	APS or SFP Optics	Cable Description	Y-Cables	1:1 Cables	Adaptor Cables
AXSM-16-155	MMF-8-155-MT	MGX-APS-CON MGX-8850-APS-CON	MTRJ to SC MM duplex cable 3m MTRJ to SC MM duplex cable 5m			CAB-MTRJ-SC-MM-3 M CAB-MTRJ-SC-MM-5 M
	SMFIR-8-155-LC	MGX-APS-CON MGX-8850-APS-CON	LC to LC SMFIR simplex 10' LC to LC SMFIR Y cable simplex 2m	CAB-SMFIR-LC-Y	CAB-SMFIR-LC	
	SMFLR-8-155-LC	MGX-APS-CON MGX-8850-APS-CON	LC to LC SMFLR simplex 10' LC to LC SMFLR Y cable simplex 2m	CAB-SMFLR-LC-Y	CAB-SMFLR-LC	
AXSM-16-155/B	SMB-4-155	MGX-APS-CON MGX-8850-APS-CON	SMB(M) to BNC(F) Y cable simplex 6" SMB(M) to BNC(F) simplex 6" SMB(M) to SMB(M) simplex 6' SMB(M) to BNC(F) simplex 6" Bundle of 6x CAB-T3E3-PL-AD Bundle of 12x CAB-T3E3-PL-AD Bundle of 16x CAB-T3E3-PL-AD Bundle of 24x CAB-T3E3-PL-AD SMB(M) to BNC(F) Y cable simplex 6" Bundle of 6x CAB-T3E3-PL-Y Bundle of 12x CAB-T3E3-PL-Y Bundle of 16x CAB-T3E3-PL-Y Bundle of 24x CAB-T3E3-PL-Y SMB(M) to BNC(F) simplex 6" CE Europe SMB(M) to BNC(F) Y cable simplex 6" CE Europe	CAB-5681-06 CAB-SMB-BNC-Y CAB-T3E3-PL-Y-6 CAB-T3E3-PL-Y-12 CAB-T3E3-PL-Y-16 CAB-T3E3-PL-Y-24 CAB-T3E3-PL-CE-Y	CAB-5698-6	CAB-5682-06 CAB-T3E3-PL-AD CAB-T3E3-PL-AD-6 CAB-T3E3-PL-AD-12 CAB-T3E3-PL-AD-16 CAB-T3E3-PL-AD-24 CAB-T3E3-PL-CE-AD
	MMF-8-155-MT/B	MGX-APS-CON MGX-8850-APS-CON	MTRJ to SC MM duplex cable 3m MTRJ to SC MM duplex cable 5m			CAB-MTRJ-SC-MM-3 M CAB-MTRJ-SC-MM-5 M
	SMFIR-8-144-LC/B	MGX-APS-CON MGX-8850-APS-CON	LC to LC SMFIR simplex 10' LC to LC SMFIR Y cable simplex 2m	CAB-SMFIR-LC-Y	CAB-SMFIR-LC	
	SMFIR-8-155-LC/B	MGX-APS-CON MGX-8850-APS-CON	LC to LC SMFLR simplex 10' LC to LC SMFLR Y cable simplex 2m	CAB-SMFLR-LC-Y	CAB-SMFLR-LC	

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Table B-32 List of Cables by Front and Back Card Types (continued)

Front Card Type	Back Card Types	APS or SFP Optics	Cable Description	Y-Cables	1:1 Cables	Adaptor Cables
AXSM-16-T3E3	SMB-8-T3		SMB(M) to BNC(F) Y cable simplex 6"	CAB-5681-06		
			SMB(M) to BNC(F) simplex 6"		CAB-5698-6	CAB-5682-06
			SMB(M) to SMB(M) simplex 6'			
			SMB(M) to BNC(F) simplex 6"			CAB-T3E3-PL-AD
			Bundle of 6x CAB-T3E3-PL-AD			CAB-T3E3-PL-AD-6
			Bundle of 12x CAB-T3E3-PL-AD			CAB-T3E3-PL-AD-12
			Bundle of 16x CAB-T3E3-PL-AD			CAB-T3E3-PL-AD-16
			Bundle of 24x CAB-T3E3-PL-AD			CAB-T3E3-PL-AD-24
			SMB(M) to BNC(F) Y cable simplex 6"	CAB-SMB-BNC-Y		
			Bundle of 6x CAB-T3E3-PL-Y	CAB-T3E3-PL-Y-6		
			Bundle of 12x CAB-T3E3-PL-Y	CAB-T3E3-PL-Y-12		
			Bundle of 16x CAB-T3E3-PL-Y	CAB-T3E3-PL-Y-16		
			Bundle of 24x CAB-T3E3-PL-Y	CAB-T3E3-PL-Y-24		
			SMB(M) to BNC(F) simplex 6" CE Europe			CAB-T3E3-PL-CE-AD
			SMB(M) to BNC(F) Y cable simplex 6" CE Europe	CAB-T3E3-PL-CE-Y		
	SMB-8-E3		SMB(M) to BNC(F) Y cable simplex 6"	CAB-5681-06		
			SMB(M) to BNC(F) simplex 6"		CAB-5698-6	CAB-5682-06
			SMB(M) to SMB(M) simplex 6'			
			SMB(M) to BNC(F) simplex 6"			CAB-T3E3-PL-AD
			Bundle of 6x CAB-T3E3-PL-AD			CAB-T3E3-PL-AD-6
			Bundle of 12x CAB-T3E3-PL-AD			CAB-T3E3-PL-AD-12
			Bundle of 16x CAB-T3E3-PL-AD			CAB-T3E3-PL-AD-16
			Bundle of 24x CAB-T3E3-PL-AD			CAB-T3E3-PL-AD-24
			SMB(M) to BNC(F) Y cable simplex 6"	CAB-SMB-BNC-Y		
			Bundle of 6x CAB-T3E3-PL-Y	CAB-T3E3-PL-Y-6		
			Bundle of 12x CAB-T3E3-PL-Y	CAB-T3E3-PL-Y-12		
			Bundle of 16x CAB-T3E3-PL-Y	CAB-T3E3-PL-Y-16		
			Bundle of 24x CAB-T3E3-PL-Y	CAB-T3E3-PL-Y-24		
			SMB(M) to BNC(F) simplex 6" CE Europe			CAB-T3E3-PL-CE-AD
			SMB(M) to BNC(F) Y cable simplex 6" CE Europe	CAB-T3E3-PL-CE-Y		

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Table B-32 List of Cables by Front and Back Card Types (continued)

Front Card Type	Back Card Types	APS or SFP Optics	Cable Description	Y-Cables	1:1 Cables	Adaptor Cables
AXSM-16-T3E3/B	SMB-8-T3		SMB(M) to BNC(F) Y cable simplex 6"	CAB-5681-06		
			SMB(M) to BNC(F) simplex 6"		CAB-5698-6	CAB-5682-06
			SMB(M) to SMB(M) simplex 6'			
			SMB(M) to BNC(F) simplex 6"			CAB-T3E3-PL-AD
			Bundle of 6x CAB-T3E3-PL-AD			CAB-T3E3-PL-AD-6
			Bundle of 12x CAB-T3E3-PL-AD			CAB-T3E3-PL-AD-12
			Bundle of 16x CAB-T3E3-PL-AD			CAB-T3E3-PL-AD-16
			Bundle of 24x CAB-T3E3-PL-AD			CAB-T3E3-PL-AD-24
			SMB(M) to BNC(F) Y cable simplex 6"	CAB-SMB-BNC-Y		
			Bundle of 6x CAB-T3E3-PL-Y	CAB-T3E3-PL-Y-6		
			Bundle of 12x CAB-T3E3-PL-Y	CAB-T3E3-PL-Y-12		
			Bundle of 16x CAB-T3E3-PL-Y	CAB-T3E3-PL-Y-16		
			Bundle of 24x CAB-T3E3-PL-Y	CAB-T3E3-PL-Y-24		
			SMB(M) to BNC(F) simplex 6" CE Europe			CAB-T3E3-PL-CE-AD
			SMB(M) to BNC(F) Y cable simplex 6" CE Europe	CAB-T3E3-PL-CE-Y		
	SMB-8-E3		SMB(M) to BNC(F) Y cable simplex 6"	CAB-5681-06		
			SMB(M) to BNC(F) simplex 6"		CAB-5698-6	CAB-5682-06
			SMB(M) to SMB(M) simplex 6'			
			SMB(M) to BNC(F) simplex 6"			CAB-T3E3-PL-AD
			Bundle of 6x CAB-T3E3-PL-AD			CAB-T3E3-PL-AD-6
			Bundle of 12x CAB-T3E3-PL-AD			CAB-T3E3-PL-AD-12
			Bundle of 16x CAB-T3E3-PL-AD			CAB-T3E3-PL-AD-16
			Bundle of 24x CAB-T3E3-PL-AD			CAB-T3E3-PL-AD-24
			SMB(M) to BNC(F) Y cable simplex 6"	CAB-SMB-BNC-Y		
			Bundle of 6x CAB-T3E3-PL-Y	CAB-T3E3-PL-Y-6		
			Bundle of 12x CAB-T3E3-PL-Y	CAB-T3E3-PL-Y-12		
			Bundle of 16x CAB-T3E3-PL-Y	CAB-T3E3-PL-Y-16		
			Bundle of 24x CAB-T3E3-PL-Y	CAB-T3E3-PL-Y-24		
			SMB(M) to BNC(F) simplex 6" CE Europe			CAB-T3E3-PL-CE-AD
			SMB(M) to BNC(F) Y cable simplex 6" CE Europe	CAB-T3E3-PL-CE-Y		

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Table B-32 List of Cables by Front and Back Card Types (continued)

Front Card Type	Back Card Types	APS or SFP Optics	Cable Description	Y-Cables	1:1 Cables	Adaptor Cables
AXSM-16-T3E3-E	SMB-8-T3		SMB(M) to BNC(F) Y cable simplex 6"	CAB-5681-06		
			SMB(M) to BNC(F) simplex 6"		CAB-5698-6	CAB-5682-06
			SMB(M) to SMB(M) simplex 6'			
			SMB(M) to BNC(F) simplex 6"			CAB-T3E3-PL-AD
			Bundle of 6x CAB-T3E3-PL-AD			CAB-T3E3-PL-AD-6
			Bundle of 12x CAB-T3E3-PL-AD			CAB-T3E3-PL-AD-12
			Bundle of 16x CAB-T3E3-PL-AD			CAB-T3E3-PL-AD-16
			Bundle of 24x CAB-T3E3-PL-AD			CAB-T3E3-PL-AD-24
			SMB(M) to BNC(F) Y cable simplex 6"	CAB-SMB-BNC-Y		
			Bundle of 6x CAB-T3E3-PL-Y	CAB-T3E3-PL-Y-6		
			Bundle of 12x CAB-T3E3-PL-Y	CAB-T3E3-PL-Y-12		
			Bundle of 16x CAB-T3E3-PL-Y	CAB-T3E3-PL-Y-16		
			Bundle of 24x CAB-T3E3-PL-Y	CAB-T3E3-PL-Y-24		
			SMB(M) to BNC(F) simplex 6" CE Europe			CAB-T3E3-PL-CE-AD
			SMB(M) to BNC(F) Y cable simplex 6" CE Europe	CAB-T3E3-PL-CE-Y		
	SMB-8-E3		SMB(M) to BNC(F) Y cable simplex 6"	CAB-5681-06		
			SMB(M) to BNC(F) simplex 6"		CAB-5698-6	CAB-5682-06
			SMB(M) to SMB(M) simplex 6'			
			SMB(M) to BNC(F) simplex 6"			CAB-T3E3-PL-AD
			Bundle of 6x CAB-T3E3-PL-AD			CAB-T3E3-PL-AD-6
			Bundle of 12x CAB-T3E3-PL-AD			CAB-T3E3-PL-AD-12
			Bundle of 16x CAB-T3E3-PL-AD			CAB-T3E3-PL-AD-16
			Bundle of 24x CAB-T3E3-PL-AD			CAB-T3E3-PL-AD-24
			SMB(M) to BNC(F) Y cable simplex 6"	CAB-SMB-BNC-Y		
			Bundle of 6x CAB-T3E3-PL-Y	CAB-T3E3-PL-Y-6		
			Bundle of 12x CAB-T3E3-PL-Y	CAB-T3E3-PL-Y-12		
			Bundle of 16x CAB-T3E3-PL-Y	CAB-T3E3-PL-Y-16		
			Bundle of 24x CAB-T3E3-PL-Y	CAB-T3E3-PL-Y-24		
			SMB(M) to BNC(F) simplex 6" CE Europe			CAB-T3E3-PL-CE-AD
			SMB(M) to BNC(F) Y cable simplex 6" CE Europe	CAB-T3E3-PL-CE-Y		
AXSM-32-T1E1-E[3]	MCC-16-E1		MCC(M) to BNC(F) simplex			CAB-MCC-BNC
			MCC(M) to BNC(F) Y-cable simplex	CAB-MCC-BNC-Y		
	RBBN-16-T1E1		RBBN 36p(M) to RBBN 36p(F) Y-cable simplex	CAB-RBBN-T1E1-Y [1]		
			2xRBBN 36p(M) to 1xRBBN 50p(F)			

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Table B-32 List of Cables by Front and Back Card Types (continued)

Front Card Type	Back Card Types	APS or SFP Optics	Cable Description	Y-Cables	1:1 Cables	Adaptor Cables
FRSM-12-T3E3	SMB-6-T3E3		SMB(M) to BNC(F) Y cable simplex 6" SMB(M) to BNC(F) simplex 6" SMB(M) to SMB(M) simplex 6' SMB(M) to BNC(F) simplex 6" Bundle of 6x CAB-T3E3-PL-AD Bundle of 12x CAB-T3E3-PL-AD Bundle of 16x CAB-T3E3-PL-AD Bundle of 24x CAB-T3E3-PL-AD SMB(M) to BNC(F) Y cable simplex 6" Bundle of 6x CAB-T3E3-PL-Y Bundle of 12x CAB-T3E3-PL-Y Bundle of 16x CAB-T3E3-PL-Y Bundle of 24x CAB-T3E3-PL-Y SMB(M) to BNC(F) simplex 6" CE Europe SMB(M) to BNC(F) Y cable simplex 6" CE Europe	CAB-5681-06 CAB-SMB-BNC-Y CAB-T3E3-PL-Y-6 CAB-T3E3-PL-Y-12 CAB-T3E3-PL-Y-16 CAB-T3E3-PL-Y-24 CAB-T3E3-PL-CE-Y	 CAB-5698-6 	 CAB-5682-06 CAB-T3E3-PL-AD CAB-T3E3-PL-AD-6 CAB-T3E3-PL-AD-12 CAB-T3E3-PL-AD-16 CAB-T3E3-PL-AD-24 CAB-T3E3-PL-CE-AD
MGX-VISM-PR-8T1	AX-RJ48-8T1		RJ48(M) to DB9(F) 6" RJ48(M) to DB9(F) 18" RJ48(M) to DB9(F) 6" RJ48(M) to DB9(F) 18"		-	CAB-5688-06 CAB-5688-18 CAB-5689-06 CAB-5689-18
	AX-R-RJ48-8T1					
MGX-VISM-PR-8E1	AX-SMB-8E1		SMB(M) to BNC(F) simplex 6" SMB(M) to SMB(M) simplex 6' SMB(M) to BNC(F) simplex 6" Bundle of 6x CAB-T3E3-PL-AD Bundle of 12x CAB-T3E3-PL-AD Bundle of 16x CAB-T3E3-PL-AD Bundle of 24x CAB-T3E3-PL-AD SMB(M) to BNC(F) simplex 6" CE Europe		CAB-5698-6	CAB-5682-06 CAB-T3E3-PL-AD CAB-T3E3-PL-AD-6 CAB-T3E3-PL-AD-12 CAB-T3E3-PL-AD-16 CAB-T3E3-PL-AD-24 CAB-T3E3-PL-CE-AD
	AX-R-SMB-8E1					
	AX-RJ48-8E1		RJ48(M) to DB9(F) 6" RJ48(M) to DB9(F) 18" RJ48(M) to DB9(F) 6" RJ48(M) to DB9(F) 18"		-	CAB-5688-06 CAB-5688-18 CAB-5689-06 CAB-5689-18
	AX-R-RJ48-8E1					
	MGX-RJ48-8E1		RJ48(M) to DB9(F) 6" RJ48(M) to DB9(F) 18" RJ48(M) to DB9(F) 6" RJ48(M) to DB9(F) 18"		-	CAB-5688-06 CAB-5688-18 CAB-5689-06 CAB-5689-18

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Table B-32 List of Cables by Front and Back Card Types (continued)

Front Card Type	Back Card Types	APS or SFP Optics	Cable Description	Y-Cables	1:1 Cables	Adaptor Cables
MGX-SRME	MGX-SMFIR-1-155	MGX-8850-APS-CON	SMF SC to SMF SC Y cable simplex	CAB-SMF-Y-SC		
	MGX-STM1-EL-1	MGX-APS-CON MGX-8850-APS-CON	 SMB(M) to BNC(F) Y cable simplex 6" SMB(M) to BNC(F) simplex 6" SMB(M) to SMB(M) simplex 6' SMB(M) to BNC(F) simplex 6" Bundle of 6x CAB-T3E3-PL-AD Bundle of 12x CAB-T3E3-PL-AD Bundle of 16x CAB-T3E3-PL-AD Bundle of 24x CAB-T3E3-PL-AD SMB(M) to BNC(F) Y cable simplex 6" Bundle of 6x CAB-T3E3-PL-Y Bundle of 12x CAB-T3E3-PL-Y Bundle of 16x CAB-T3E3-PL-Y Bundle of 24x CAB-T3E3-PL-Y SMB(M) to BNC(F) simplex 6" CE Europe SMB(M) to BNC(F) Y cable simplex 6" CE Europe	 CAB-5681-06 CAB-SMB-BNC-Y CAB-T3E3-PL-Y-6 CAB-T3E3-PL-Y-12 CAB-T3E3-PL-Y-16 CAB-T3E3-PL-Y-24 CAB-T3E3-PL-CE-Y	 CAB-5698-6	 CAB-5682-06 CAB-T3E3-PL-AD CAB-T3E3-PL-AD-6 CAB-T3E3-PL-AD-12 CAB-T3E3-PL-AD-16 CAB-T3E3-PL-AD-24 CAB-T3E3-PL-CE-AD
MGX-SRM-3T3/C	MGX-BNC-3T3-M		BNC(M) to BNC-(F) Y cable simplex 6"	CAB-BNC-Y CAB-BNC-Y/B		
MGX-RPM-PR-256	MGX-MMF-FE					
	MGX-RJ45-4E/B					
	MGX-RJ45-FE					
	MGX-RPM-1FE-CP					
	MGX-RJ45-5-ETH					
MGX-RPM-PR-512	MGX-MMF-FE					
	MGX-RJ45-4E/B					
	MGX-RJ45-FE					
	MGX-RPM-1FE-CP					
	MGX-RJ45-5-ETH					
MGX-RPM-XF-512	MGX-XF-UI					
	MGX-1GE					
	MGX-2-GE					
	MGX-1OC12 POS-IR	GLC-LH-SM GLC-SX-MM GLC-ZX-SM				
	MGX-2OC-12 POS-IR	GLC-LH-SM GLC-SX-MM GLC-ZX-SM				
AX-CESM-8T1	AX-RJ48-8T1		RJ48(M) to DB9(F) 6" RJ48(M) to DB9(F) 18" RJ48(M) to DB9(F) 6" RJ48(M) to DB9(F) 18"		-	CAB-5688-06 CAB-5688-18 CAB-5689-06 CAB-5689-18
	AX-R-RJ48-8T1					
AX-CESM-8T1/B	AX-RJ48-8T1		RJ48(M) to DB9(F) 6" RJ48(M) to DB9(F) 18" RJ48(M) to DB9(F) 6" RJ48(M) to DB9(F) 18"		-	CAB-5688-06 CAB-5688-18 CAB-5689-06 CAB-5689-18
	AX-R-RJ48-8T1					

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Table B-32 List of Cables by Front and Back Card Types (continued)

Front Card Type	Back Card Types	APS or SFP Optics	Cable Description	Y-Cables	1:1 Cables	Adaptor Cables
AX-CESM-8E1	AX-SMB-8E1		SMB(M) to BNC(F) simplex 6" SMB(M) to SMB(M) simplex 6' SMB(M) to BNC(F) simplex 6" Bundle of 6x CAB-T3E3-PL-AD Bundle of 12x CAB-T3E3-PL-AD Bundle of 16x CAB-T3E3-PL-AD Bundle of 24x CAB-T3E3-PL-AD SMB(M) to BNC(F) simplex 6" CE Europe		CAB-5698-6	CAB-5682-06 CAB-T3E3-PL-AD CAB-T3E3-PL-AD-6 CAB-T3E3-PL-AD-12 CAB-T3E3-PL-AD-16 CAB-T3E3-PL-AD-24 CAB-T3E3-PL-CE-AD
	AX-R-SMB-8E1					
	AX-RJ48-8E1		RJ48(M) to DB9(F) 6" RJ48(M) to DB9(F) 18" RJ48(M) to DB9(F) 6" RJ48(M) to DB9(F) 18"		-	CAB-5688-06 CAB-5688-18 CAB-5689-06 CAB-5689-18
	AX-R-RJ48-8E1					
	MGX-RJ48-8E1		RJ48(M) to DB9(F) 6" RJ48(M) to DB9(F) 18" RJ48(M) to DB9(F) 6" RJ48(M) to DB9(F) 18"		-	CAB-5688-06 CAB-5688-18 CAB-5689-06 CAB-5689-18
AX-FRSM-8E1	AX-SMB-8E1		SMB(M) to BNC(F) simplex 6" SMB(M) to SMB(M) simplex 6' SMB(M) to BNC(F) simplex 6" Bundle of 6x CAB-T3E3-PL-AD Bundle of 12x CAB-T3E3-PL-AD Bundle of 16x CAB-T3E3-PL-AD Bundle of 24x CAB-T3E3-PL-AD SMB(M) to BNC(F) simplex 6" CE Europe		CAB-5698-6	CAB-5682-06 CAB-T3E3-PL-AD CAB-T3E3-PL-AD-6 CAB-T3E3-PL-AD-12 CAB-T3E3-PL-AD-16 CAB-T3E3-PL-AD-24 CAB-T3E3-PL-CE-AD
	AX-R-SMB-8E1					
	AX-RJ48-8E1		RJ48(M) to DB9(F) 6" RJ48(M) to DB9(F) 18" RJ48(M) to DB9(F) 6" RJ48(M) to DB9(F) 18"		-	CAB-5688-06 CAB-5688-18 CAB-5689-06 CAB-5689-18
	AX-R-RJ48-8E1					
	MGX-RJ48-8E1		RJ48(M) to DB9(F) 6" RJ48(M) to DB9(F) 18" RJ48(M) to DB9(F) 6" RJ48(M) to DB9(F) 18"		-	CAB-5688-06 CAB-5688-18 CAB-5689-06 CAB-5689-18

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Table B-32 List of Cables by Front and Back Card Types (continued)

Front Card Type	Back Card Types	APS or SFP Optics	Cable Description	Y-Cables	1:1 Cables	Adaptor Cables
AX-FRSM-8E1-C	AX-SMB-8E1		SMB(M) to BNC(F) simplex 6" SMB(M) to SMB(M) simplex 6' SMB(M) to BNC(F) simplex 6" Bundle of 6x CAB-T3E3-PL-AD Bundle of 12x CAB-T3E3-PL-AD Bundle of 16x CAB-T3E3-PL-AD Bundle of 24x CAB-T3E3-PL-AD SMB(M) to BNC(F) simplex 6" CE Europe		CAB-5698-6	CAB-5682-06 CAB-T3E3-PL-AD CAB-T3E3-PL-AD-6 CAB-T3E3-PL-AD-12 CAB-T3E3-PL-AD-16 CAB-T3E3-PL-AD-24 CAB-T3E3-PL-CE-AD
	AX-R-SMB-8E1					
	AX-RJ48-8E1		RJ48(M) to DB9(F) 6" RJ48(M) to DB9(F) 18" RJ48(M) to DB9(F) 6" RJ48(M) to DB9(F) 18"		-	CAB-5688-06 CAB-5688-18 CAB-5689-06 CAB-5689-18
	AX-R-RJ48-8E1					
	MGX-RJ48-8E1		RJ48(M) to DB9(F) 6" RJ48(M) to DB9(F) 18" RJ48(M) to DB9(F) 6" RJ48(M) to DB9(F) 18"		-	CAB-5688-06 CAB-5688-18 CAB-5689-06 CAB-5689-18
AX-FRSM-8T1	AX-RJ48-8T1		RJ48(M) to DB9(F) 6" RJ48(M) to DB9(F) 18" RJ48(M) to DB9(F) 6" RJ48(M) to DB9(F) 18"		-	CAB-5688-06 CAB-5688-18 CAB-5689-06 CAB-5689-18
	AX-R-RJ48-8T1					
AX-FRSM-8T1-C	AX-RJ48-8T1		RJ48(M) to DB9(F) 6" RJ48(M) to DB9(F) 18" RJ48(M) to DB9(F) 6" RJ48(M) to DB9(F) 18"		-	CAB-5688-06 CAB-5688-18 CAB-5689-06 CAB-5689-18
	AX-R-RJ48-8T1					
MGX-FRSM-2CT3	MGX-BNC-2T3		BNC(M) to BNC-(F) Y cable simplex 6"	CAB-BNC-Y	CAB-BNC-Y/B	
MGX-FRSM-2T3E3	MGX-BNC-2T3		BNC(M) to BNC-(F) Y cable simplex 6"	CAB-BNC-Y	CAB-BNC-Y/B	
	MGX-BNC-2E3		BNC(M) to BNC-(F) Y cable simplex 6"	CAB-BNC-Y	CAB-BNC-Y/B	
	MGX-BNC-2E3A		BNC(M) to BNC-(F) Y cable simplex 6"	CAB-BNC-Y	CAB-BNC-Y/B	
MGX-FRSM-HS2/B[4]	SCSI2-2HSSI/B		SCSI2(M) to SCSI2(F) Y cable 15"	CAB-SCSI2-Y		
	MGX-12IN1-8S		SS(M) to V.35(M) DTE 10' SS(M) to V.35(F) DTE 10' (uncommon) SS(M) to V.35(F) DCE 10' SS(M) to V.35(M) DCE 10' (uncommon) SS(M) to X.21(F) DCE 10' SS(M) to X.21(M) DTE 10' SS(M) Loopback tester (no product ID)			CAB-SS-V35MT CAB-SS-V35FT CAB-SS-V35FC CAB-SS-V35MC CAB-SS-X21FC CAB-SS-X21MT

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Table B-32 List of Cables by Front and Back Card Types (continued)

Front Card Type	Back Card Types	APS or SFP Optics	Cable Description	Y-Cables	1:1 Cables	Adaptor Cables
MPSM-8-T1E1	AX-RJ48-8T1		RJ48(M) to DB9(F) 6" RJ48(M) to DB9(F) 18" RJ48(M) to DB9(F) 6" RJ48(M) to DB9(F) 18"		-	CAB-5688-06 CAB-5688-18 CAB-5689-06 CAB-5689-18
	AX-R-RJ48-8T1					
	AX-RJ48-8E1		RJ48(M) to DB9(F) 6" RJ48(M) to DB9(F) 18" RJ48(M) to DB9(F) 6" RJ48(M) to DB9(F) 18"		-	CAB-5688-06 CAB-5688-18 CAB-5689-06 CAB-5689-18
	AX-R-RJ48-8E1					
	AX-SMB-8E1		SMB to BNC Y-Cable	CAB-SMB-BNC-Y		
	AX-R-SMB-8E1					
MPSM-16-T1E1	RBBN-16-T1E1-1N		RBBN 36p(M) to RBBN36p(F) RBBN Y-cable	CAB-RBBN-T1E1-Y [1]		CAB-RBBN-T1E1[1]
	MCC-16-E1-1N		MCC(M) to BNC(F) simplex MCC(M) to BNC(F) Y-cable simplex	CAB-MCC-BNC-Y		CAB-MCC-BNC
	RED-16-T1E1					
	MCC-16-E1		MCC(M) to BNC(F) simplex MCC(M) to BNC(F) Y-cable simplex	CAB-MCC-BNC-Y		CAB-MCC-BNC
	RBBN-16-T1E1		RBBN 36p(M) to RBBN36p(F) RBBN Y-cable	CAB-RBBN-T1E1-Y [1]		CAB-RBBN-T1E1[1]
MPSM-T3E3-155	SFP-2-155		Single-mode Fiber Y-cable with LC connector, IR or LR Multi-mode fiber Y-cable with LC connector	CAB-SMF-LC-Y CAB-MMF-LC-Y		
	BNC-3-T3E3		BNC(M) to BNC-(F) Y cable simplex 6"	CAB-BNC-Y	CAB-BNC-Y/B	
	SMB-2-155-EL		SMB(M) to BNC(F) Y cable simplex 6"	CAB-SMB-BNC-Y		
MGX-VXSM-T1E1	VXSM-BC-24-T1E1		VXSM 24 T1/E1 Y cable VXSM 24 T1/E1 interface cable VXSM 24 T1/E1 loopback cable	CAB-RBBN-24-T1E 1-Y		

1. Two cables required per back card, one TX and one RX
2. Special cable CAB-ADPT-75-120
3. Special cable CAB-RBBN-T1E1
4. Special cable 72-1479-01

List of Cables Illustrated in this Appendix

Table B-33 lists the cables that are illustrated in the remainder of this appendix. Cables appear in alphabetical order. The number of cables illustrated in this cable guide will increase with each release of this hardware installation guide.

Table B-33 Location of Cable Illustrations in This Appendix

Cable Name	Cable Location in this Appendix
CAB-MMF-LC	Figure B-8 on page B-38
CAB-MMF-LC-Y	Figure B-9 on page B-38

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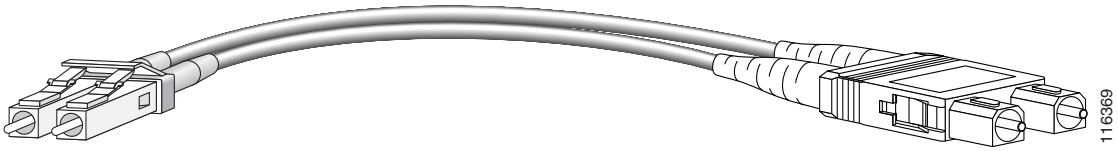
Table B-33 Location of Cable Illustrations in This Appendix (continued)

Cable Name	Cable Location in this Appendix
CAB-RBBN-16-T1E1	Figure B-10 on page B-38
CAB-RBBN-16T1E1-Y	Figure B-11 on page B-39
CAB-SMFIR-LC	Figure B-12 on page B-40
CAB-SMFIR-LC-Y	Figure B-13 on page B-41
CAB-SMFLR-LC	Not shown. See Figure B-12 on page B-40
CAB-SMFLR-LC-Y	Not shown. See Figure B-13 on page B-41

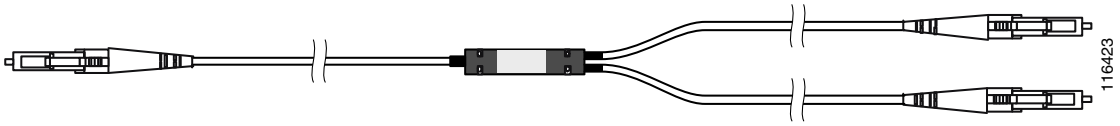
CAB-MMF-LC

Figure B-9 CAB-MMF-LC (Multimode LC Cable) (72-3742-01)



CAB-MMF-LC-Y

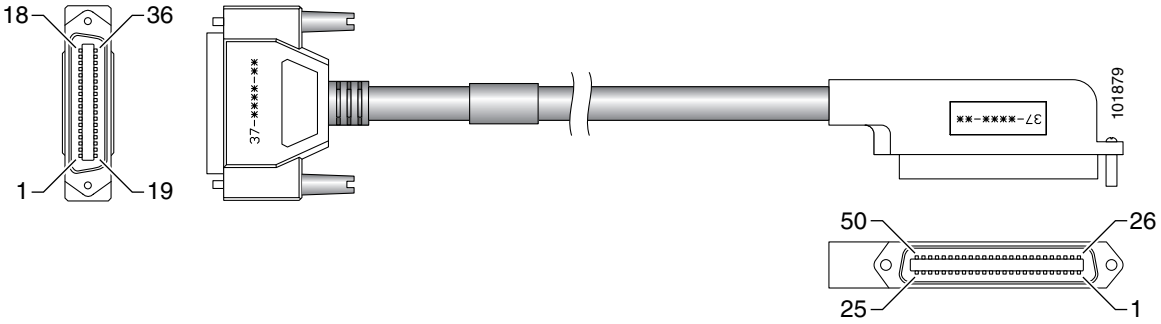
Figure B-10 CAB-MMF-LC-Y (72-3811-01) Cable



CAB-RBBN-16-T1E1

The CAB-RBBN-16-T1E1 cable is used on the RBBN-16-T1E1 back card. You need two cables per back card, one TX and one RX.

Figure B-11 CAB-RBBN-16-T1E1 Cable



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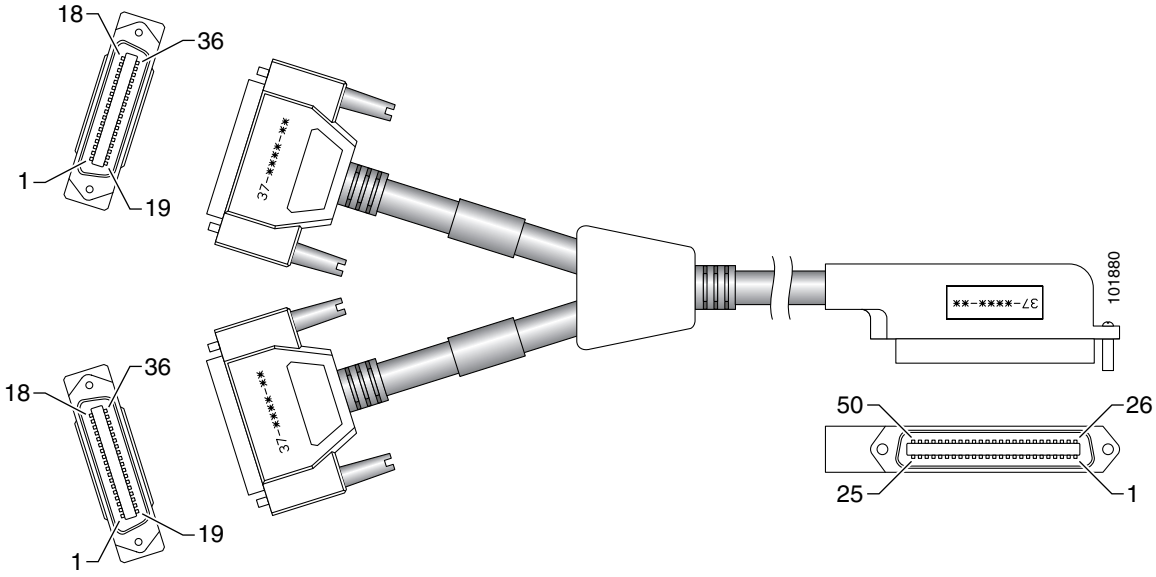
CAB-RBBN-16T1E1-Y

The CAB-RBBN-16T1E1-Y cable is used on the RBBN-16-T1E1 back card. You need two cables per back card, one TX and one RX.

Figure B-12 CAB-RBBN-16T1E1-Y Cable



CAB-RBBN-16T1E1 Cable Connector Pin Assignments

The CAB-RBBN-16T1E and CAB-RBBN-16T1E1-Y cable connectors pin assignments are shown inTable B-34. In the RBBN card, Tx and Rx are separated into two connectors, and the cable is identical for both connectors. That is why the table lists only tip and ring instead of TTIP/TRING and RTIP/RRING.

Table B-34 CAB-RBBN-16T1E1 Cable Connector Pin Assignments

Signal name	36-Pin Plug	50-Pin Plug
Line 1 – tip	18	26
ring	36	1
Line 2 – tip	17	27
ring	35	2
Line 3 – tip	16	28
ring	34	3
Line 4 – tip	15	29
ring	33	4
Line 5 – tip	14	30
ring	32	5
Line 6 – tip	13	31
ring	31	6

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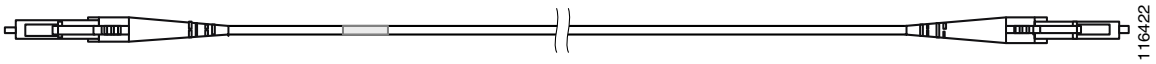
Table B-34 CAB-RBBN-16T1E1 Cable Connector Pin Assignments (continued)

Signal name	36-Pin Plug	50-Pin Plug
Line 7 – tip	12	32
ring	30	7
Line 8 – tip	11	33
ring	29	8
Line 9 – tip	8	34
ring	26	9
Line 10 – tip	7	35
ring	25	10
Line 11 – tip	6	36
ring	24	11
Line 12 – tip	5	37
ring	23	12
Line 13 – tip	4	38
ring	22	13
Line 14 – tip	3	39
ring	21	14
Line 15 – tip	2	40
ring	20	15
Line 16 – tip	1	41
ring	19	16
Unused pins	9, 10, 27, and 28	17 to 25
		42 to 50

CAB-SMFIR-LC

Figure B-13 CAB-SMFIR-LC (72-1932-01) Cable



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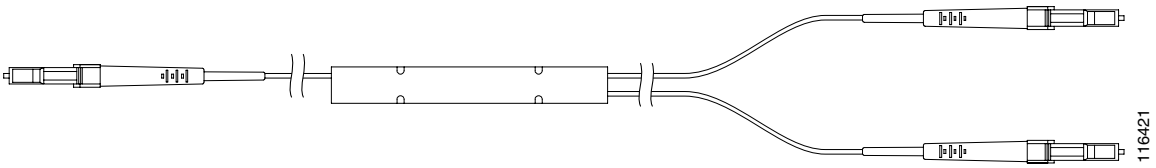
CAB-SMFIR-LC-Y

Figure B-14 CAB-SMFIR-LC-Y (72-1931-01) Cable



CAB-SMFLR-LC

See Figure B-13 on page B-40.

CAB-SMFLR-LC-Y

See Figure B-14 on page B-41.

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APPENDIX C

Earthing and Bonding Recommendations

Note This appendix applies to the Cisco MGX switches and gateways described in this guide: MGX 8850 (PXM45/PXM1E), MGX 8850/B, MGX 8950, MGX 8830 and MGX 8830/B multiservice switches and the MGX 8880 Media Gateway.

This appendix discusses the techniques and policies that Cisco practices with regard to DC power, earthing, and bonding of Cisco equipment. It also explains why these techniques are the best practice. More specifically, this appendix describes the techniques for DC power and earth bonding for Cisco MGX switches.

The appendix also discusses the principles of mesh bonding and explains the earth return systems that are used in the Cisco MGX switch. It identifies the earthing points, shows how they are to be earthed, and how the DC power connections are to be connected to the equipment.

The earthing and powering techniques described in this appendix are extracts from Cisco internal documentation, engineering documentation, and the following standards documentation:

- ITU-T K.27, Bonding configurations and earthing inside a telecommunications building
- GR-1089-CORE, Electromagnetic compatibility and electrical safety—generic criteria for network telecommunications equipment

Scope

The bonding and earthing principles adopted by Cisco are as follows:

- Promote personal safety and reduce fire hazards
- Enable telecomm signaling with earth return
- Minimize equipment damage and service interruption
- Minimize radiated and conducted electromagnetic emissions and susceptibility
- Maximize tolerance to discharge of electrostatic energy and lightning interference

This appendix supports the principles listed above by providing information that complies with relevant safety standards on the following topics:

- Bonding and earthing of the Cisco WAN equipment at the telco sites
- Shielding provided by cabinets, cable trays, and cable shields
- Techniques for verifying and maintaining bonding and earthing networks

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- Required values of voltage and resistance between different CBN bonding points

EC [3] Definitions

The following definitions apply to terminology found in IEC 50 [3]:

Earth	The conductive mass of the earth, whose electric potential at any point is conventionally taken as equal to zero. In some countries the word “ground” is used instead of “earth.”
Earth electrode	A conductive part or a group of conductive parts in intimate contact with and providing an electrical connection to earth.
Earthing network	The part of an earthing installation that is restricted to the earth electrodes and their interconnections.
Main earthing terminal	A terminal or bar that is provided for the connection of protective conductors, including equipotential bonding conductors and conductors for functional earthing, if any, to the means of earthing.
Earthing conductor	A protective conductor that connects the main earthing terminal or bar to the earth electrode.
Equipotential bonding	Electrical connection putting various exposed conductive parts and extraneous conductive parts at a substantially equal potential.
Equipotential bonding conductor	A protective conductor for ensuring equipotential bonding.
Neutral conductor (N)	A conductor that is connected to the neutral point of a system and capable of contributing to the transmission of electrical energy.
Protective conductor (PE)	A conductor that is required by some measures for protection against electric shock by electrically connecting any of the following parts: • Exposed conductive parts • Extraneous conductive parts • Main earthing terminal • Earth electrode • Earthed point of the source or artificial neutral

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K.27 Definitions

The following definitions apply to terminology found in K.27:

Bonding network (BN)	A set of interconnected conductive structures that provide an electromagnetic shield for electronic systems and personnel at frequencies from DC to low RF. The term “electromagnetic shield” denotes any structure used to divert, block, or impede electromagnetic energy. In general, a BN need not be connected to earth, but all BNs in this recommendation have an earth connection.
Common bonding network (CBN)	The CBN is the primary way to create effective bonding and earthing inside a telecommunication building. It is the set of metallic components that are intentionally or unintentionally interconnected to form the principal BN in a building. These components include: • Structural steel or reinforcing rods • Metallic plumbing • AC power conduit • PE conductors • Cable racks • Bonding conductors The CBN always has a mesh topology and is connected to the earthing network.
Mesh-BN (MBN)	A bonding network in which all associated equipment frames, racks, cabinets, and the DC power return conductor are bonded together and also bonded at multiple points to the CBN. Consequently, the mesh-BN augments the CBN.
Isolated bonding network (IBN)	A bonding network that has a single point of connection (SPC) to either the common bonding network or another isolated bonding network. All IBNs in this document have a connection to earth via the SPC.
Single point connection (SPC)	The unique location in an IBN where a connection is made to the CBN. In reality, the SPC is not a mere “point” but has sufficient size to accommodate the connection of multiple conductors. Usually, the SPC is a copper bus-bar. If cable shields or coaxial outer conductors are to be connected to the SPC, the SPC could be a frame with a grid or sheet metal structure.

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Mesh-IBN	A type of IBN in which the components of the IBN (equipment frames) are interconnected to form a mesh-like structure. This may, for example, be achieved by multiple interconnections between cabinet rows or by connecting all equipment frames to a metallic grid (bonding mat) that extends away from beneath the equipment. The bonding mat is, of course, insulated from the adjacent CBN. If necessary the bonding mat could include vertical extensions that result in an approximation to a Faraday-cage. The spacing of the grid depends upon the frequency range of the electromagnetic environment.
Star IBN	A type of IBN comprising clustered or nested IBNs sharing a common SPC.
System block	All the equipment whose frames and associated conductive parts form a defined BN.
Isolated DC return (DC-I)	A DC power system in which the return conductor has a single point connection to a BN. More complex configurations are possible. (See the "Bonding Networks" section in this appendix.)
Common DC return (DC-C)	A DC power system in which the return conductor is connected to the surrounding BN at many locations. This BN could be either a mesh-BN (resulting in a DC-C-MBN system) or an IBN (resulting in a DC-C-IBN system). More complex configurations are possible. (See the "Bonding Networks" section in this appendix.)

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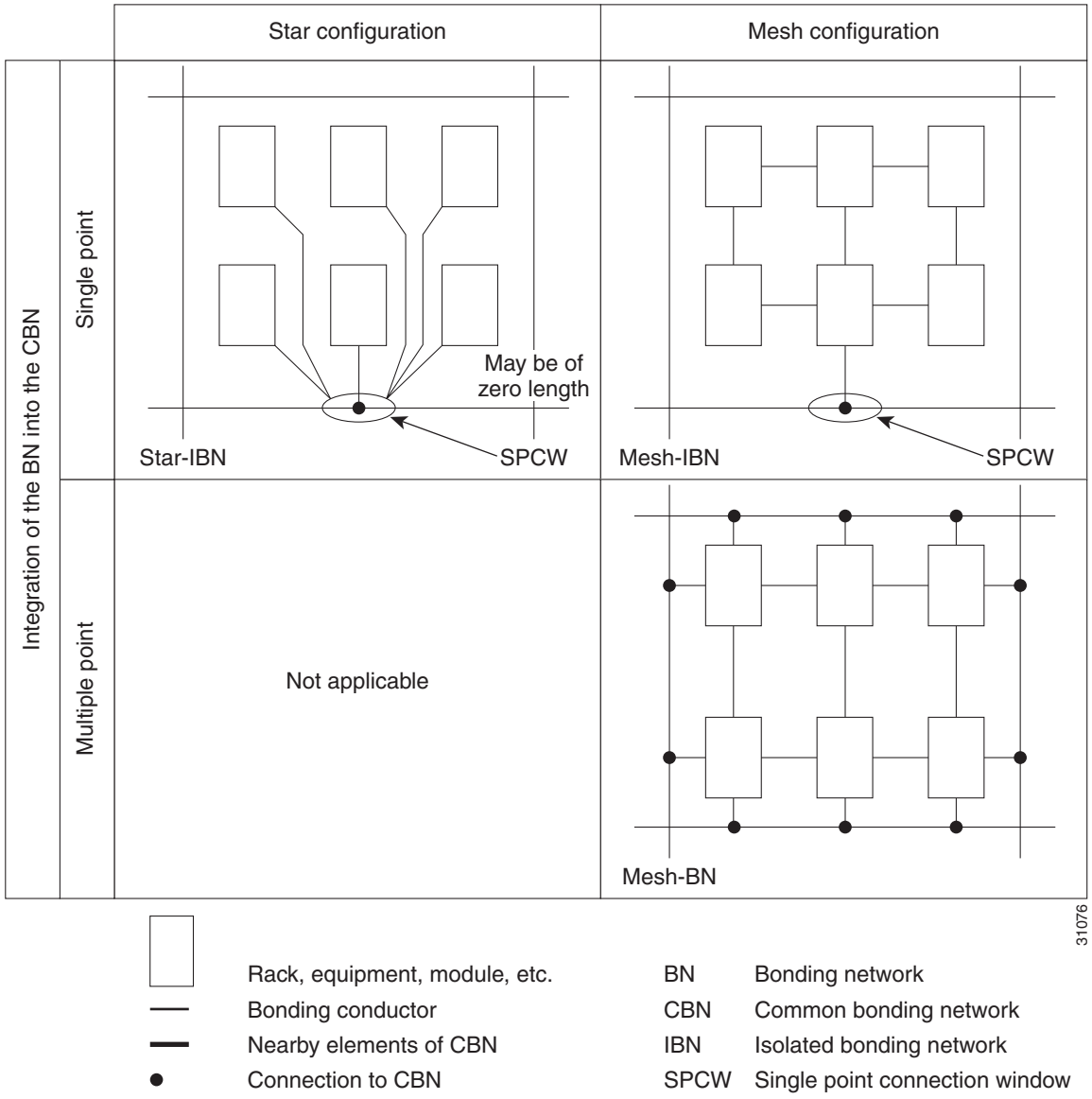
Figure C-1 shows examples of star and mesh topologies.

Figure C-1 Star and Mesh Topology Examples



Bonding Networks

Bonding and earthing are accomplished through the construction and maintenance of bonding networks (BNs), which are connected and grounded to earth. In this appendix, BN refers to common bonding networks (CBNs), mesh-BNs (MBNs), and isolated bonding networks (IBNs) collectively. The acronym BN implies that a connection to earth exists.

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The purpose of a BN is to shield people and equipment from the adverse effects of electromagnetic energy from DC to low RF range. Lightning and both AC and DC power faults are the energy sources that cause the greatest concern. Of less concern are quasi-steady-state sources such as AC power harmonics and function sources, such as clock signals from digital equipment.

The energy sources that cause concern are referred to as emitters. The people and equipment that can suffer adversely from these emitters are referred to as susceptors.

The coupling between an emitter and a susceptor can be characterized as a transfer function. The purpose of a BN is to reduce the magnitude of the transfer function to an acceptable level. Reducing the magnitude of the transfer function is achieved through the design of the BN; specifically, in the way that MBNs and IBNs are attached to the CBN. The practical aspects of this design are discussed below.

A BN can also function as a return conductor for signaling applications, as a connection to earth for ground return signaling, and as a path for power fault currents. A BN that can handle large currents can rapidly de-energize faulted power circuits.

Digital System Grounding

For the Cisco MGX switch, Cisco policy has been to ground the return of the 48 VDC directly to the frame at the backplane. This method of grounding prevents transient currents caused by lightning or power surges from entering the system through the backplane, upsetting system performance and possibly damaging components.

Isolating grounds like this one, using only analog methods, does not address the current high-speed digital system requirements. Digital systems today have such high speeds and large bandwidths that they now produce frequencies with harmful effects. Consequently, digital systems now require multipoint grounding.

Isolation using analog methods provides at the physical level of our interfaces and not at the power-supply end.

The bus currents and isolation parasitic capacitance that are represented by the 48 VDC side of the system create much greater threat levels to the backplane of our systems, which have embedded communication buses distributed through them. To mitigate these effects, you must bond and provide the lowest possible impedance to ground at the backplane.

Capacitors used to isolate the DC common paths are inadequate at RF frequencies outside the backplane structure. Therefore, isolation must be kept to multipoint ground the 48 VDC return to chassis and logical ground at the backplane level of the Cisco equipment.

Bellcore GR-1089, 1997 edition, speaks of these recent challenges in Chapter 9. This new thinking is the outgrowth of the ITU-T K.27 recommendations released in 1991. The bonding of meshed bonding networks and the digital high speeds dictate the eventual acceptance of this new philosophy on a universal basis.

The CE-Mark requirements for the induced effects of transient and power surge lightning cannot be met with large, high impedance (150 M ohms or greater) grounding wires. These standard grounding conductors have a very high impedance at frequencies greater than 10 MHz.

The grounding of the frames and the mesh bonding network must be effective over a frequency range of 60 Hz to 100 GHz according to Bellcore requirements. 30 cm of wire represents 30 nH of inductance. This represents 2 ohms of reactance at a frequency of 30 MHz. This high impedance would be a large change from earth reference if earth were several stories below the equipment installation.

A four-story building would represent 1000 ohms above ground during a 30 MHz frequency disturbance in this example. Therefore it is required that multipoint, meshed bonding networks be used to control these excitation currents.

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Equipment backplane speeds are in the category above 800 MHz. Because the design must anticipate the worst case scenario, concerns about RF damage are much greater. At 800 MHz only 10 inches of wire represents 500 ohms reactance.

For the average coaxial cable shield integrity to be maintained, the termination of the shield must see a ground reference of no more than 50 ohms. The importance of this relationship is that although the 800 MHz speed is not the data speed of E1/T1, it must mitigate frequency susceptibility issues that will upset the 800 MHz operation.

Therefore, the multipoint grounding techniques must be used as supported by the K.27 recommendations. Although K.27 is designed around lightning and transient issues, the same theory applies to the higher frequency problems; they are just smaller in scale. As frequency increases, the wave length becomes smaller, and the reactance of a fixed length of wire goes up.

The need is to multipoint ground our backplane and the 48 VDC return directly to the frame at frequent intervals that represent at least 1/20 of a wavelength. The frame, in turn, will be bonded to the isolated mesh-bonding mat. At 800 MHz, 18.8 mm represent a 20th of a wavelength, so grounding/bonding must be done at these intervals to maintain backplane-to-cabinet integrity for its full perimeter. Using capacitors to achieve the necessary bonding becomes extremely difficult at these frequencies in addition to the added cost due to the isolation breakdown voltage requirements of 2.1 kilovolts, should the old philosophy be insisted upon.

The theoretical concepts are confirmed by practical experience and lead to the general principles listed below. A consequence of applying these principles is that the number of conductors and interconnections in the CBN is increased until adequate shielding is achieved. Concerning the important issue of electric shock, the following implementation principles apply to mitigation of electric shock as well as to equipment malfunction:

1. All elements of the CBN shall be interconnected. Multiple interconnections, resulting in a three-dimensional mesh, are especially desirable. Increasing the number of CBN conductors and their interconnections increases the CBN shielding capability and extends the upper frequency limit of this capability.
2. It is desirable for the egress points for all conductors leaving the building (including the earthing conductor) to be located close together. In particular, the AC power entrance facilities, telecommunications cable entrance facilities, and the earthing conductor entry point should be close together.
3. The facility should have a main earthing terminal located as close as possible to the entrance to the AC power and telecommunications cable entrance facilities. The main earthing terminal shall connect to the following:
   - Earthing electrode(s) via a conductor of shortest length
   - One or more earthing electrodes
   - Neutral conductor of the AC power feed (in TN systems)
   - Cable shields (at the cable entrance) either directly or via arresters or capacitors if required by corrosion considerations
4. The CBN shall be connected to the main earthing terminal. Multiple conductors between the CBN and the main earthing terminal are recommended.
5. As contributors to the shielding capability of the CBN, interconnection of the following items of the CBN is important:
   - Metallic structural parts of the building including I-beams and concrete reinforcement where accessible
   - Cable supports, trays, racks, raceways, and AC power conduit

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6. The coupling of surges into indoor signal or power cabling is reduced, in general, by running the cables in close proximity to CBN elements. However, in the case of external surge sources, the currents in the CBN will tend to be greater in peripheral CBN conductors. This is especially true of lightning down-conductors.

   Therefore, it is best to avoid routing cables in the periphery of the building. When this is unavoidable, metallic ducts that fully enclose the cables may be needed. In general, the shielding effect of cable trays is especially useful, and metallic ducts or conduit that fully enclose the cables provide nearly perfect shielding.

7. In steel frame high-rise buildings, the shielding effects that the steel frame provides against lightning strikes can help. For cables extending between floors, maximum shielding is obtained by locating the cables near the center of the building. However, as stated above, cables enclosed in metallic ducts may be located anywhere.

8. If the facility has over-voltage primary protection on telecommunication wires, it should have a low impedance connection to the cable shield, if it exists, and to the surrounding CBN.

9. Over-voltage protectors are advisable at the AC power entrance facility if the telecommunication building is located in an area where power lines are exposed to lightning. These protectors should be bonded with low impedance to the CBN.

10. Mechanical connections in a protection path of the CBN whose electrical continuity may be insufficient shall be bypassed by jumpers that are visible to inspectors. These jumpers shall comply with IEC requirements for safety. However, for EMC applications, the jumpers should have low impedance.

11. The CBN facilitates the bonding of cable shields or outer conductors of coaxial cables at both ends by providing a low impedance path in parallel and in proximity to the cable shields and outer conductors. Thus, most of the current driven by potential differences is carried by the highly conductive members of the CBN. Disconnection of one cable shield for inspection should minimally affect the current distribution in the CBN.

The main feature of a mesh-BN is the interconnection at many points of cabinets and racks of telecommunications and other electrical equipment as well as multiple interconnections to the CBN.

Telecommunication techniques sometimes use circuits for signaling with earth return, for example, lines with ground start, three wire inter-exchange connection. Equipment interconnected by these circuits needs functional earthing.

The signaling range is normally determined by the resistance of the current path. Most of this resistance is contributed by the earth electrodes. The performance provided by the earthing network via the main earthing terminal is generally sufficient for this signaling purpose.

Bonding and Grounding the Cisco MGX System

To maintain the full EMI and EMC integrity of this equipment, the equipment must be bonded to an *integrated ground plane* or a *non-isolated ground plane* network. The purpose is to mitigate the damaging effects of electrostatic discharge or lightning.

Refer to the latest edition of ITU-T Recommendation K.27 or Bellcore GR-1089-CORE to ensure that the correct bonding and grounding procedures are followed. As recommended in these documents, a frame bonding connection is provided on the Cisco cabinet for rack-mounted systems. To see how to make a connection, see the "Ground the Frame Bonding Ground Connection for a Cisco-Supplied Rack" section on page 5-10.

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Except for the AC power supply modules, every module in a rack-mount system uses the rack for grounding. Therefore, the rack must connect to protective earth ground, and the equipment must be secured to the rack so as to ensure good bonding.

A DC-powered node must have grounding conductors that connect at two separate locations:

- The grounding conductor provided with the supply source must connect to the correct terminal of the power entry module (PEM).
- A grounding conductor must connect to an appropriate terminal on a rack or the chassis of a node.

For DC-powered systems, Cisco has designed the Cisco MGX 8800 and MGX8900 series switches to connect to a *non-isolated* ground system. In contrast, routers and other LAN equipment often use an *isolated* grounding scheme.

If properly wired together through an *equalization connection* as described in ITU-T recommendation K.27, the isolated and non-isolated ground systems can form a mixed grounding system. The potential between any points in the ground system—whether or not the ground system is mixed—must not exceed 2 percent of the referenced voltage (2 percent of 48 V is 960 millivolts).

Bonding and Grounding MGX 8800 or MGX 8900 Series Chassis in a Rack

To maintain proper grounding/ bonding connections when installing an MGX 8800 or MGX 8900 series chassis in a rack, clean all paint from the surface of the rack rails that face to the unpainted surfaces of the MGX mounting flanges and apply an anti-oxidant to the unpainted surfaces. Then install the chassis.

Wiring a Mixed Ground System with Redundant Supplies

A mixed ground system appears in Figure C-2. This figure shows safety and earth grounds and the primary and redundant DC sources Battery A and Battery B. Individual ground conductors are labeled Z1, Z2, Z3, Z4, and Z5. The Z represents the impedance of the ground conductor between a chassis, for example, and a connection to the building's ground system.

The numbers 1–4 represent building ground points and indicate that an impedance can exist between different points in the ground system of the building. Each of these symbols indicates that a voltage drop may result (but must not exceed 2 percent of the referenced voltage). See Table C-1 for a definition of each Z1–Z5.

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Figure C-2 Mixed Grounding System

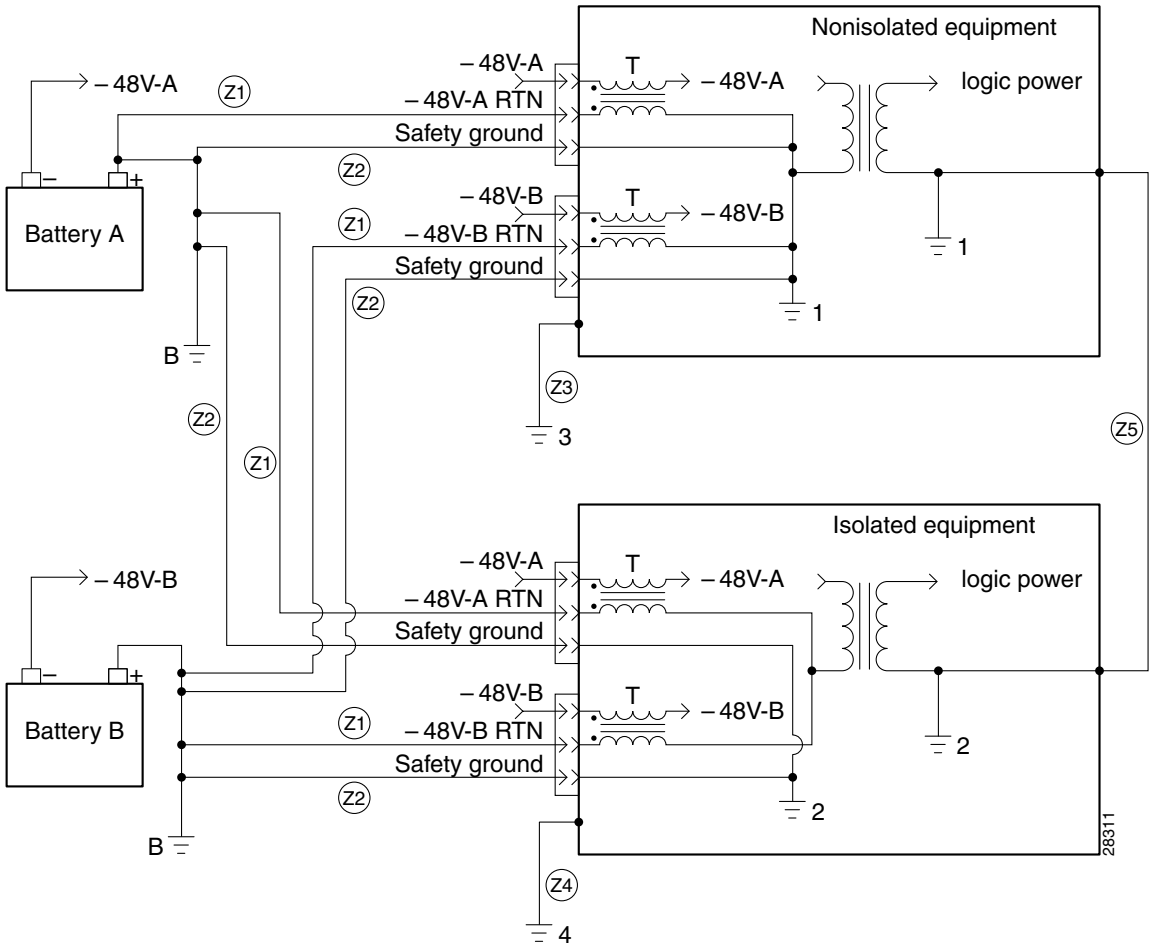

Table C-1 Ground Point Descriptions for Mixed Grounding

Connection	Description
Z1	–48 VDC return.
Z2	Protective earth or safety ground (green/yellow).
Z3	Equipment ground for non-isolated equipment.
Z4	Equipment ground for isolated equipment.
Z5	Equalizing frame ground. This ground creates low-impedance equalization between frames.
B	Battery ground.
1, 2, 3, 4	Connection points to the building's ground system: a potential can exist between these points within the ground system.
T	Common-mode EMI filters.

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As Figure C-2 shows, the non-isolated system has a 48-VDC return that internally connects to the backplane. (This design calls for a hard-wired return and so does not allow for an *optional* or alternate ground connection.) The internal connection provides a low-impedance connection between 48-VDC return and frame ground. This grounding scheme protects the signals on the backplane from corruption by transients that can result from lightning or electrostatic discharge.

To improve protection against transients, the loop area (and resultant loop impedance) should be made as small as possible by locating the –48-VDC supply, 48-VDC return, and protective earth conductors as close to each other as possible.

As recommended in ITU-T K.27, the multipoint grounding in a mesh bonding network provides the best protection for equipment by providing the lowest impedance in the ground system. For more detailed information, refer to the recommendation itself.

Conductor Characteristics for Carrying Current and Ensuring Low Voltage Drops

For signal degradation to be averted, a conductor must be large enough to prevent its impedance from creating a voltage drop equal to 2 percent of the reference voltage. Also, the protective earth conductor must be large enough to carry all the current if the 48 VDC return fails. This latter requirement is for safety. Full fault redundancy is achieved by having equal size conductors for the protective earth ground and the 48 VDC return of the switch.

For wire gauges that prevent unacceptable voltage drops over different lengths of copper wire, see Table C-2. For the resistance of 1000 feet of copper wire for each gauge of wire, see Table C-3. These references are for planning purposes and might be further subject to local laws and practices.

Note Table C-2 is for reference. It is recommended that you use 50-A or greater.

Table C-2 Wire Gauge for Current Loads over Copper Wire Lengths

DC Current	Distance in Feet						
	25 feet	50 feet	75 feet	100 feet	150 feet	200 feet	400 feet
5 A	18 gauge	14 gauge	14 gauge	12 gauge	10 gauge	8 gauge	6 gauge
10 A	14 gauge	12 gauge	10 gauge	8 gauge	8 gauge	6 gauge	2 gauge
15 A	14 gauge	10 gauge	8 gauge	8 gauge	6 gauge	4 gauge	2 gauge
20 A	12 gauge	8 gauge	8 gauge	6 gauge	4 gauge	2 gauge	0 gauge
25 A	12 gauge	8 gauge	6 gauge	4 gauge	4 gauge	2 gauge	0 gauge
30 A	10 gauge	8 gauge	6 gauge	4 gauge	2 gauge	2 gauge	00 gauge
35 A	10 gauge	6 gauge	4 gauge	2 gauge	2 gauge	1 gauge	000 gauge
40 A	8 gauge	6 gauge	2 gauge	2 gauge	2 gauge	0 gauge	000 gauge
45 A	8 gauge	6 gauge	4 gauge	2 gauge	1 gauge	0 gauge	0000 gauge
50 A	8 gauge	4 gauge	4 gauge	2 gauge	1 gauge	00 gauge	—
55 A	8 gauge	4 gauge	2 gauge	2 gauge	0 gauge	00 gauge	—
60 A	8 gauge	4 gauge	2 gauge	2 gauge	0 gauge	00 gauge	—
65 A	6 gauge	4 gauge	2 gauge	1 gauge	0 gauge	000 gauge	—

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Table C-2 Wire Gauge for Current Loads over Copper Wire Lengths (continued)

DC Current	Distance in Feet						
	25 feet	50 feet	75 feet	100 feet	150 feet	200 feet	400 feet
70 A	6 gauge	4 gauge	2 gauge	1 gauge	00 gauge	000 gauge	—
75 A	6 gauge	4 gauge	2 gauge	1 gauge	00 gauge	000 gauge	—
100 A	4 gauge	2 gauge	1 gauge	00 gauge	000 gauge	—	—

Note Table C-3 is for reference, it is recommended that you use 6 gauge or greater.

Table C-3 Resistance for Each Gauge of Copper Wire

Gauge	Ohms per 1000 Feet	Gauge	Ohms per 1000 Feet
0000	0.0489	10	0.9968
000	0.0617	11	1.257
00	0.0778	12	1.5849
0	0.098	13	1.9987
1	0.1237	14	2.5206
2	0.156	15	3.1778
3	0.1967	16	4.0075
4	0.248	17	5.0526
5	0.3128	18	6.3728
6	0.3944	19	8.0351
7	0.4971	20	10.1327
8	0.6268	21	12.7782
9	0.7908	22	16.1059

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Guide to Transceivers (SFPs) Used with MGX Back Cards

This appendix lists the small form-factor pluggable (SFP) transceivers that are used in MGX products, and the back cards they are used with. Table D-1 lists which SFP is used with which back card, the SFP part number, the SFP product ID number, wavelength, fiber type, maximum distance, and connector type.

Tx/Rx power is not included in this table, because that information is part of Bellcore standards (GR-253, pages 4-14 to 4-22).

Table D-1 Cross Reference of SFP Transceivers to Back Cards

Back Card	SFP Part Number	SFP Product ID	Wavelength (nm)	Fiber Type	Max. Distance (meter)	Connector Type[1]
SFP-8-155	10-1308-01	MMF-1-155-SFP	1310	Multimode	200 (w/62.5um core) or 500 (w/50um core)	LC
	10-1283-01	SMFIR-1-155-SFP	1310	Single-mode	15K	LC
	10-1280-01	SMFLR-1-155-SFP	1310	Single-mode	40K	LC
VXSM-BC-4-155	10-1308-01	MMF-1-155-SFP	1310	Multimode	200 (w/62.5um core) or 500 (w/50um core)	LC
	10-1283-01	SMFIR-1-155-SFP	1310	Single-mode	15K	LC
	10-1280-01	SMFLR-1-155-SFP	1310	Single-mode	40K	LC
MGX-2OC12POS	10-1829-01	SMFIR-622-SFP	1310	Single-mode	15K	LC
	10-1827-01	SMFLR-622-SFP	1310	Single-mode	40K	LC
MGX-2GE	30-1301-01	GLC-SX-MM	850	Multimode	200 (with 62.5um core) or 500 (with 50um core)	LC
	30-1299-01	GLC-LH-SM	1300	Single-mode	10K	LC
	10-1837-01	GLC-ZX-SM	1550	Single-mode	70K	LC

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Table D-1 Cross Reference of SFP Transceivers to Back Cards (continued)

Back Card	SFP Part Number	SFP Product ID	Wavelength (nm)	Fiber Type	Max. Distance (meter)	Connector Type[1]
SMF-4-2488-SFP	10-1421-03	SMFSR-1-2488-SFP	1300	Single-mode	2K	LC
	10-1742-01	SMFLR-1-2488-SFP	1300	Single-mode	40K	LC
	10-1591-01	SMFXLR-1-2488-SFP	1550	Single-mode	80K	LC

1. LC connectors are manufactured under license from Optical Fiber Systems (formerly Lucent Technologies). The LC is a small form factor interconnect based upon the RJ-45 telephone interface. LC is a fiber duplex connector that has a ferrule size of 1.25u opposed to the 2.5u for FC and SC type connectors.

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A

AC Alternating current

AIS Alarm indication signal

APS Automatic protection switching

ASAC Any service, any card

ASAP Any service, any port

ASIC Application specific integrated circuit

ATM Asynchronous transmission mode

AUSM ATM User-to-Network Interface (UNI) service module -- a single-height front card

AWG American wire gauge

AXSM ATM switching service module

B

BERT Bit error rate testing

BITS Building Integrated Timing Supply

BTU British thermal unit

C

CALEA Communications Assistance to Law Enforcement Act

CB Cell bus

CBSM Cell bus service module

CESM Circuit emulation service module --a single-height back card

CLI Command line interface

CO Central office

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CP Console port or control port

CSU Channel service unit

CWM Cisco WAN Manager, the MGX multiservice switch network management system.

D

DC Direct current

DCE Data communications equipment

DSP Digital signal processor

DTE Data terminal equipment

E

EMI Electromagnetic interference

ESD Electrostatic discharge

F

FE Fast Ethernet

FRSM Frame Relay service module -- a single-height front card

G

GE Gigabit Ethernet (as in MGX-1GE card)

GUI Graphical user interface

H

HD Hard drive

HDPE

HSSI High speed serial interface

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I

IOS Internet operating system

IP Internet protocol

K

kpps kilo packets per second

L

LAN Local area network

LED Light emitting diode

LH Long haul

LM Line module

LOF Loss of frame

LOS Loss of signal

M

MCC Miniature coaxial cable.

MDVT Mechanical design validation test

MGX Media Gateway Switch. This was the original name of the MGX family of multiservice switches.

MIPS Millions of instructions per second

MMF Multimode fiber.

MP Maintenance port or modem port

MPLS Multiprotocol label switching

MPSM Multiprotocol service module

N

NBSM Narrow band service module

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nm nanometer

NNI Network-to-network interface

O

OC Optical Carrier

P

PE

PEM Power entry module

PNNI Private Network-to-Network Interface

POS Packet over SONET

PPP Point-to-point protocol

PSTN Public switched telephone network

PXM Processor switching module -- a double height front card. There are several types of PXM cards—The PXM1 uses MGX Release 1.x software, the PXM45 uses MGX Release 2 and higher software and includes models PXM45, PXM45/B, and PXM45/C, and the PXM1E uses MGX Release 3 and higher software.

R

RBBN Ribbon (cable)

RCON Redundancy connector

RPM Route processing module -- a double-height back card

RPM-PR RPM-Premium Router

RPM-XF RPM-Express Forwarding

RU Rack unit—an industry standard unit of measurement. One RU is equal to 1.75 inches (4.45 cm).

Rx Receive

S

SES Service Expansion Shelf

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SETS	Synchronous equipment timing source
SFP	Small form-factor pluggable
SLIP	Serial line interface protocol
SM	Service module
SMB	Sub-miniature BNC
SMFIR	Single-mode fiber, intermediate-reach.
SMFLR	Single-mode fiber, long reach.
SMFSR	Single-mode fiber, short reach
SMFXLR	Single-more fiber, extended long reach
SNMP	Simple network management protocol
SONET	Synchronous optical network
SPVC	Soft permanent virtual circuit
SRM	Service resource module -- a single-height front card.
SRME	Service resource module enhanced -- a single-height front card, used in the MGX 8850 (PXM45) switch.
STM	Synchronous transfer mode

T

TAC	Cisco's Technical Assistance Center
TDM	Time division multiplexed
Tx	Transmit

U

UI	User interface
UNI	User-to-Network Interface
UTP	Unshielded twisted pair

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V

V.21 An ITU-T modem protocol for 300 bits per second two-wire full-duplex communications using Frequency Shift Keying modulation. All modern modems support both V.21 and the close variant, Bell 103.

V.35 The ITU-T standard for data transmission at 48 kbs over 60 - 108 KHz group band circuits. It contains the 34-pin V.34 connector specifications normally implemented on a modular RJ-45 connector.

VISM-PR Voice interworking service module -- Premium

VOIP Voice over Internet protocol

VPN Virtual private network

VSVD Virtual source/virtual destination

VXSM Voice switch service module

W

WAN Wide area network

X

XF Express Forwarding (as in RPM-XF)

XM Switch module. The switch fabric card used in MGX 8950.

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